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THE AMERICAN POTASH INSTITUTE
1155 16TH STREET, N. W. WASHINGTON, D. C.

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington, D. C.

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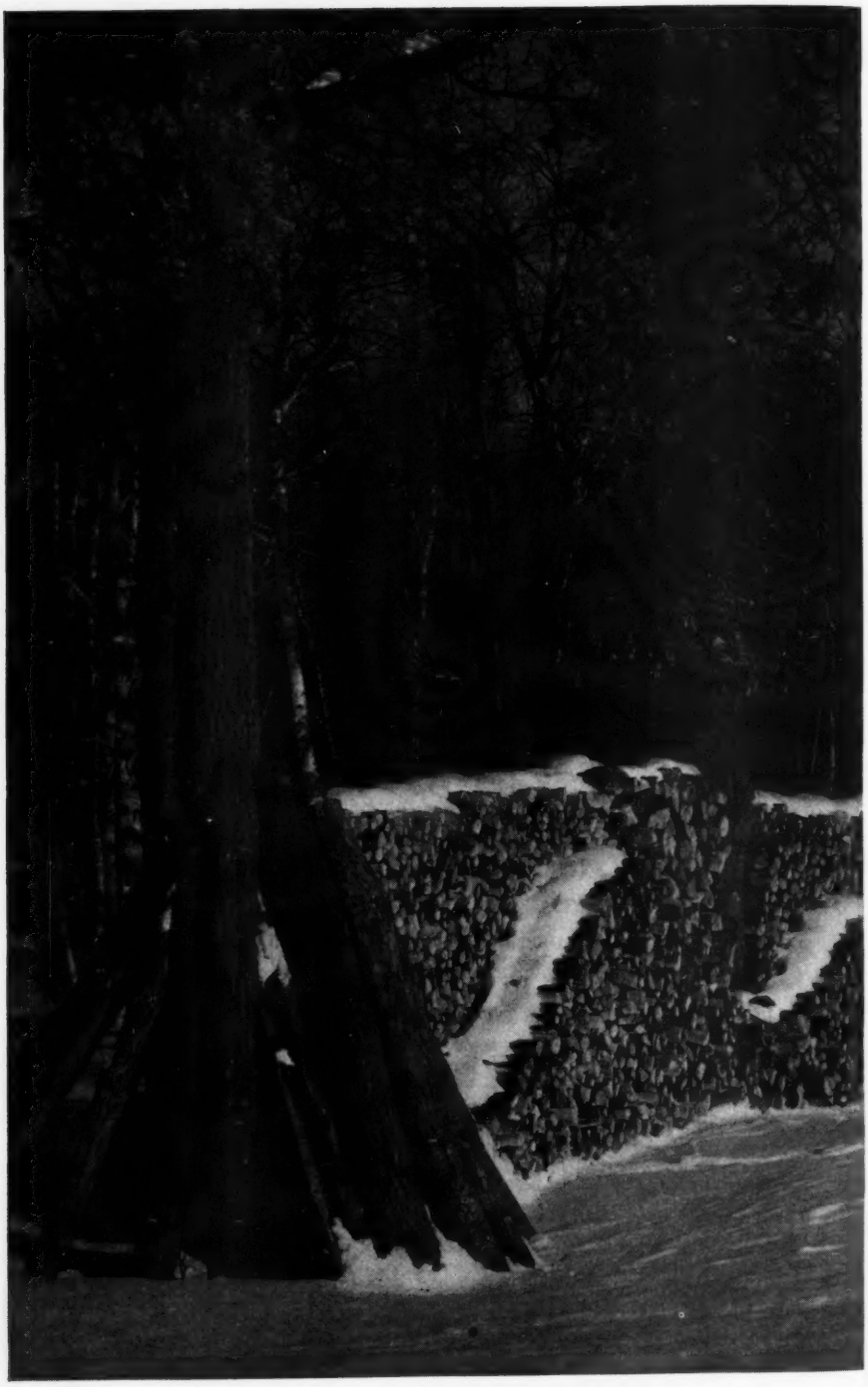

THE WOODPILE—A NECESSARY FARM "STOCKPILE."

Better Crops with PLANT FOOD

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VOL. XXVI WASHINGTON, D. C., FEBRUARY 1942 No. 2

Civilians, too, will do a . . .

Squads Right!

Jeff McDermid

INSTEAD of talking about Youth at the Crossroads, we now shrink from the truth that Youth is on the Firing Line. Out our way, as in hundreds of other American communities, folks who have ambled along in the family way for a generation are brought up squarely to face what for them is a new set of conditions—yet by no means a new situation in our historical background.

Last week a third contingent of draftees shouldered their rucksacks and departed this life as we know it in our bailiwick. I looked them over down at the depot and shook hands with a dozen lads who have arrived at "man's estate" only to find it heavily mortgaged. A number of these boys are leaving with reluctance and some inner resentment at an apparent bungle in society, which they naturally infer is none of their making but plenty of their business hereafter.

Among them were recruits who were thrust into my small orbit as follows: One boy with a loud whistle who delivered my daily paper at a penny profit per; one youth with more vigor than veracity whom I tried to teach in Sunday school; one with five years' record as an unremitting snow shoveler and lawn grass mower in our block; another who delivered our modest but often bulky groceries at the back door and nibbled a few dozen of Mother's cookies betimes; and three or four more who bobbed up week-end evenings to

escort my daughters to sundry simple sociables, and who were verified beforehand as sober lads and careful drivers. Not being the sire of sons, I am unable to point to rich acquaintanceship with boy scout hikes and important conferences at night over the mysteries of radio sets, airplane models, scroll-saw jobs, and bench work; or boast the degree of allegiance to the lodge of boyhood vouchsafed to men who have had the direct training of masculine minds.

While lacking this contact, I feel that as long as the world depends on the harmony of the sexes to keep it going, I may rightfully discern some personal interest in the departure of those kids who persisted so long in attendance upon my daughters, and those others who probably waited upon somebody else's girls just as solicitously. Though I didn't have a hand in showing any of them the way to wind a reel or saw a plank or row a boat, I figured in their world finally when they sought and found romance and feminine companionship. And so this gives me a license to prattle on about their affairs, which have now become our major concern and which mean so much more to us neighbors than as though these boys had just finished college and wandered off to their first jobs away from home.

IN that case they would have been lost to us except for filtered messages of promotion or failure or being home on a short vacation to get married or something. What they did would have been but a passing item of casual interest under the old civilian routine. But since they are now signed up for more glory than they ever wished for in summer daydreams and smaller pay than they got when they worked for me, I notice a great difference in our regard for their future welfare.

No, I don't mean they are going to be made into knights overnight by some sergeant, or that they will relish the drumbeat of martial fervor. They are going to be too darn close to realities to catch the spirit that the rest of us will assume toward them, out here waiting by ourselves alone—shoveling our walks and running errands and cutting our grass and thinking how much better and faster they did it.

It's we who will be the ones to cry, "They're in the Army Now," and publish their pictures and praise them and feel sorry for any Japs or any others who start knocking off chips from broad Yankee shoulders like theirs! It'll be a lot like rooting for the old high school team after all, won't it? Sure, all except the catch in your voice.

If we live in good old Dixie, we'll begin to compare this and that fellow who left our town with such manly defenders of state rights as Robert E. Lee, Stonewall Jackson, or that daring and spectacular hero, Jeb Stewart. If we have been nursed in northern brands of the same strain of native valor, we will sing their praises in terms of the best of our ancient colonels who refrained from vandalism and accepted victory modestly at last.

AND together we will all join in cooperative tribute to American tradition and focus our hopes on the chance that our departed lads may be led by just as inspiring and devoted men as roving Robert Rogers, crafty General Marion, the Swamp Fox, and that old ironsides of "Jehoshaphat and the Continental Congress," Ethan Allen of Ticonderoga. It will warm the cockles of stay-at-home hearts to imagine them in barracks or behind barricades, stemming right up from the seeds of glory as America planted them long before Japan was "civilized."

Or we can refresh our boyhood memories on the doings of Teddy Roosevelt and the Rough Riders, Funston and the defeat of Aguinaldo, recalling the outbound trainloads with broad brown hats and leather leggings who left our towns in 1898, victory bound like hell bent for election. Moreover some of us can bring it down to a nearer day, when the first infant bawls of these new heroes were mixed with the din of the armistice of 1918, and the world

was made safe for democracy "over there."

This teaches us that we hanker for a little sacrificial stimulation about so often in our mundane lives. We get to plodding along keeping store and dictating letters and selling washing machines and listening to dull sermons and reading tiresome essays. We take everybody as "automatic Americans," as natural legatees of that which is calm

and peaceful and standpat, and maybe just a bit shabby and grubby too. We try to think up new plays and novels and make them stinky in spots so they will be read widely and profitably. We go in for fads and repeat trite sayings and turn on the radio for jazz and go to bed too late. We talk about stamina and reserve power and heroism as something we found in the new historical set we bought for Christmas, not anything which fits into the present rushing world of come-hither and go-yonder. Ah, no, my friends of easier days, it won't do to "tell this to the Marines!" It's far too prosaic and common to fit into Wake Island! We've got to foster something better before they come back, and I don't mean maybe.

We've got to assume a share of the deprivation and bereavement ourselves. And that means whether we have sons bearing arms and flying planes or not. It signifies being hard-headed and realistic for many of us who have been soft-minded to an extent that is alarming. We must hitch up our braces and prove to the deluded, despotic countries abroad that democratic nations know how to live up to their historic inheritance.

To begin with, we've got to distinguish in our minds from now on the real difference between bereavement and deprivation. Plenty of us have it all solidified together and don't know one from t'other.

I MEET fellows every day who have no relatives in the war but who feverishly seize each evening's paper to see what the war board has done to them in the past twenty-four hours. I am one of those behindhand guys who fail to keep track of all the industrial rules and regulations about sugar and tires and metals and motors. I confess to a woeful indifference to what mileage lies ahead for me in my buzz-buggy; although I am not going to change my methods of driving or my care of the car simply because I've always let folks whizz past me and kept a watchful eye on the mechanism anyhow. I haven't tried to interview any tire bootleggers or bothered the ration board.

Yet lots of men in my neighborhood have become geared so tight to the motor age that they seem bewildered and agitated beyond measure. They hate to think of changing cars at lonely junctions again and spending time in hotels with those old red railway guide books or bus folders. For them this is real bereavement, a tragedy and a personal affront. So they haunt the ration boards and snoop around second-hand tire shops, becoming easy marks for countless rackets afloat. In these days, all this looking around high and low surely means "rubbering" if it ever did; and restless hours abed call for a change in terms from "nightmare" to "night-tire."

I know it's hard on the traveling salesmen and I fully sympathize with them. But in my youth the erstwhile jolly, philandering drummers were "faster" in spots than the boys with bags are today, and had more time to tell funny stories and make life worth while en route.

Denial of rapid locomotion, hither

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Boron Deficiency On Long Island

By R. H. White-Stevens

Long Island Vegetable Research Farm, Riverhead, New York

THE soils of Long Island cannot be considered as possessing a natural fertility comparable with that found in many other vegetable-growing regions of the United States. However, the combined advantages of a favorable climate, the proximity of the New York City markets, and excellent transportation facilities have resulted in vegetable growers on the Island employing cultural practices which have led to the maintenance of high levels of production in all the major crops grown. Potatoes frequently yield 300 to 400 bushels of U. S. Grade 1 per acre, cauliflower 400 crates per acre, lima beans 350 hampers (30 pounds each) per acre, and brussel sprouts 6,000 quarts per acre. Some 25 other crops are grown, all producing yields comparable with those obtained on the best vegetable soils in the country.

Of the many cultural factors which go to produce a successful crop on Long Island, the one which receives the most attention is the fertilizer program. The comparatively rapid leaching of nitrogen and the excessive fixation of phosphorus have led to the use of large amounts of complete fertilizers. Applications of commercial fertilizers of such analyses as 4-8-4, 4-8-7, and 5-10-5 made at rates of from 1,500 to 2,000 pounds per acre per crop are considered standard practice. Organic matter is usually maintained by the use of green manures because the increasing dearth of farm livestock has raised the cost of manure to a prohibitive degree.

Thus the only source of external plant nutrients is the fertilizer applied. The bulk of this fertilizer is composed of mineral components, and with the improvements in the manufacture and purification of mineral fertilizers such as nitrate of soda, phosphates, and potash salts, the inclusion of incidental elements has been reduced. It is true that some organic sources, particularly of nitrogen, contain various supplementary elements, but these sources, such as fish scrap, castor pomace, cottonseed meal, and tankage, are too costly to be employed as a sole source of nitrogen and are consequently used in comparatively small quantities, largely as conditioners.

These fertilizer practices have tended to induce associated minor element problems, the chief of which, on Long Island, appears to be boron deficiency. It would be both unfair and untrue to assign the recent increase in boron deficiency on Long Island soils solely to the fertilizers employed, as several factors, discussed later, are equally if not more responsible. Nevertheless, the constant withdrawal and leaching of boron from the soil and the incomplete return in the fertilizers applied have not tended to correct the deficiency.

Symptoms

The first requirement for the practical control of a boron deficiency is the recognition of the symptoms of the deficiency on the crop in question. Essential though it is, it is not as easy as it might appear. Boron deficiency may frequently be effecting a distinct curb upon the growth of a crop as expressed in ultimate yields, and yet it may not be reflected in the appearance of the plants. On Long Island this has been

observed frequently. Obviously, when a visible symptom appears on the plant it indicates that the deficiency has attained a degree where it not only reduces growth but actually commences to kill the plant. Even at this stage accurate diagnosis is not always simple because another essential element may have become deficient simultaneously, and the symptoms of the two deficiencies collectively may be quite different from those of either deficiency alone. Nevertheless, there are certain rather

Fig. 1. The effect of boron deficiency on the growing point of cauliflower early in the life of the plant.

characteristic symptoms of boron deficiency, which when known, are fairly easy to recognize and provide a significant clue to diagnosis. For simplicity we may consider these by plant organs.

Growing points.

Growth slows down as the deficiency develops, and the growing points of the plant begin to suffer. At first growth may continue slowly, weakly, and unevenly, with the resulting leaves becoming curled, gnarled, lopsided, and distinctly impaired as food-manufacturing centers. Eventually, if the deficiency persists, the growing points simply wither and die (See Fig. 1).

Stems.

The stem tissue breaks down, particularly those regions involved in translocating to the rest of the plant foodstuffs manufactured in the foliage (e.g. sugars, elementary proteins, etc.). This tissue literally becomes plugged with gummy materials, the identity of which is unknown, and the resulting upheaval created in the surrounding tissue frequently causes the stem or leaf petioles to split and crack. This symptom is often seen by the grower in rutabaga, cauliflower, and celery plants suffering from boron deficiency in the field (See Figs. 2 and 3).

Leaves.

The foliage is also affected, the young growing leaves as described above, and the older foliage first by purpling, followed by a border yellowing and gradual withering and die-back. These leaves being the regions where foodstuffs, sugars and starches, are chiefly manufactured tend to become stiff, thick, and very brittle owing to excessive accumulation of these substances (See Fig. 4).

Roots.

Roots show variable effects but usually tend to throw excessive branch roots. This condition arises as the result of degeneration and death of the absorptive tips of the roots.

Large storage roots, such as those of rutabagas and beets, develop various internal symptoms which become visible externally only in very severe cases, the development of water-soaked, blackened, or pithy regions being the most frequent (See Figs. 5 and 6). These symptoms are of extreme economic significance as they affect the market value of the crop. The grower can readily harvest such roots and ship them to market in good faith, only to receive severe criticism or have goods condemned as poor in quality and unsalable. In some cases it has been

found that flavor and storage and shipping stability may be distinctly below the required level without there being any visible symptoms at time of harvest.

Fruits.

Reproductive tissues, though not commonly affected in vegetables, may also suffer various types of breakdown, either dropping prematurely or withering on the plant and ultimately rotting from secondary decay.

It is unusual to observe all these symptoms arising on the same plant simultaneously since under field conditions boron deficiency may occur at different times with varying intensity and from a variety of causes. In general it develops either during the major growth period of the plant or just before maturity. It must be remembered, however, that the visible symptoms are but the end point of a severe upheaval in the normal functioning of the plant, and when they do make their appearance the plant has been suffering for some time. It is this fact which accounts for the reduced quality found in crops grown at a level of boron nutrition below normal requirement, yet at one high enough to prevent the incidence of apparent symptoms.

On Long Island the chief factors which cause boron deficiency are heavy consumption of boron by crop growth, failure to return to the soil an adequate supply in the fertilizers applied, and leaching of the natural borates by rain and melting snow.

The consumption of boron varies enormously with the type of crop. Thus root crops tend to consume relatively large amounts of boron, but even among root crops there are variable requirements. Beets and rutabagas appear to be gross consumers, while carrots are injured quite easily by excess applications of boron. The cruciferous family appears to require comparatively large quantities of borax and shows wide limits of tolerance. Many of the legume family and the solanaceous family, on the other hand, are quite sensitive to boron. Leafy crops such as spinach, lettuce, and endive have small requirements and yet are still fairly tolerant to boron. Celery has a fairly

Fig. 2. Cracked petiole in rutabaga, indicating an advanced stage of boron deficiency.

Fig. 3. Hollow stem in cauliflower caused by boron deficiency.

high boron requirement, and suffers inordinately if it is deficient.

The data presented in the subsequent tables give an idea of the extremely variable tolerance and requirements of some of the more important vegetable crops grown on Long Island.

As has been mentioned previously, the bulk of the fertilizer used on Long Island vegetable farms is composed of comparatively well-processed mineral salts in which boron, as a contaminant, is very low. Apart from the failure to replenish boron as it is consumed by plant growth, there is the added factor of stimulation in boron requirement induced by the major mineral fertilizers. Nitrogen and phosphorus, for example, will tend to increase the boron requirement of plants due to their stimulating effect upon growth. It has been found that the degree of boron deficiency developing in a crop grown on a boron-deficient soil is in direct proportion to the rate and amount of growth attained by the crop. In specific tests with beets and rutabagas, the correlation was found to surpass significance at odds of 999:1. Potash also will tend to increase boron deficiency on soils low in available quantities of the latter element even under conditions where increased potash has no effect upon yield. The exact nature of this interrelation between potash and boron is not clear as yet.

The question of leaching of available borates from the soil is a significant one on Long Island for two reasons. First, the soils are characteristically acid, having a natural soil reaction highly buffered in the region of pH 4.8 — 5.4. This condition renders the natural borates soluble, and consequently subject to leaching. Second, the high sand and gravel content of the surface soils, combined with low clay and organic matter contents and an extremely porous subsoil, permits even moderate rains to effect distinctly heavy leaching. The application of lime to such soils tends to reduce the loss of boron from leaching in wet seasons, but amplifies the deficiency by reducing the available boron in dry years.

It is of interest in this regard to note the difference in the incidence of boron

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Fig. 4. Boron deficiency on rutabaga foliage. The older foliage becomes thick, purpled, and eventually yellow and dead at the edges.

The Jachim Brothers of Wheatfield, Indiana, with an exhibit of the crops which won for them the title, "Champion Muck Crop Farmers for 1941."

Cooperation

By Roscoe Fraser

Agricultural Extension Service, Purdue University, Lafayette, Indiana

NO better example of the statement, "In union there is strength," can be found than in the Jachim family of Wheatfield, Jasper County, Indiana. This family of 6 young men and women, ranging in ages from 20 to 40, by sticking together and working as one unit accomplished more last year than many people do in a lifetime. One member of this family has just been crowned Indiana's Potato King, and the entire family shared honors in winning the much coveted title of Champion Muck Crop Farmers.

Several years ago, when medals were first given in the muck area for high yields of onions and potatoes, the mother of this fine family remarked how nice it would be if someday they might win a medal. The remark was apparently forgotten, yet when they were told of the honors they had won their first expressed thought was "Gosh, wouldn't Mom and Dad be proud?"

In this group there is no claiming of individual credit. They work together in perfect harmony. After their father's death they held a conference to decide what they should do. Since the death of their mother some years before, the girls had done the housekeeping. The boys had done the actual farming for many years as their father was an invalid. So they decided they would try to carry on as they had been doing. There is no grasping for authority, and there are no quarrels or arguments.

They have a very good system for avoiding quarrels that might be well used by more pugnacious people. Every

problem is discussed by the family as a whole. Each expresses an opinion, without arguing, and when the decision is made the plan is put into action as the majority wished it.

Louis, the eldest brother, works in Chicago but spends every week end and holiday at the farm. He takes an active part in all the planning and managing, but Joe, Frank, and Ed do the actual farming of the 520 acres. Joe, who is married and has a small son, lives on the farm, but in a house about 200 feet distant from the others. Frances and Agnes share the house and garden work, with Agnes doing the secretarial work, too. A more cooperative family would be hard to find.

The Jachims were all born on an 80-acre, mostly-sand farm in Starke County, Indiana, where the land runs from the very poorest to the very best in the entire State. The small patch of muck they had was not enough to keep them all busy, so one or two of the boys usually found time to work for a neighbor, Bill Gehring.

"It was like going to school to work for Bill," they said. And it is doubtful if they could have found a more able teacher, for Bill Gehring ranks as one of the most progressive and successful of muck farmers. Fired by Bill's successes, they decided to branch out for themselves. Three years ago they bought 240 acres of muck land near Wheatfield. Since then they have purchased another 280 acres, increasing their present acreage to 520. At the present time they do not intend to buy more land. Their idea is to possess, not be possessed by, the land.

In 1941 the boys tried onion raising for the first time. That they were apt pupils and hard workers is proven by the fact that Frank produced more yellow globe onions on one acre than anyone else in the state last year, 1,248.5 bushels; Joe produced 1,230.39 and Ed 1,201.74 bushels—a total of 3,680.63 bushels on three acres. On 50 acres they grew a total of 68,750 bushels. These yields put them all in the 1,000-Bushel Onion Club and entitled each of them to a gold medal given by the Northern Indiana Muck Crop Growers Association and the Purdue Horticultural Extension Department.

The onion fields were plowed 8 to 10 inches deep November 1 to 10. They were double disked twice, harrowed twice, and rolled with a 36-inch concrete roller twice last spring. They were then floated, or leveled, three times. Onion seed, 4½ pounds per acre, was planted 1 inch deep and in 16-inch rows April 25 to 29. Fertilizers, 1,950 pounds of 3-12-15 and 100 pounds of copper sulphate per acre, were applied with a grain drill, going over the ground twice. The fields were hand-weeded twice, wheel-hoed twice, and plowed twice with a small garden tractor. The onions were pulled and topped September 15 to 20.

In 1940 this ground was in potatoes which had been fertilized with 1,500 pounds of 3-9-18 per acre, producing 500 bushels per acre. Soybeans were grown here in 1939 but were not harvested due to wet weather. For several years before this nothing but wild hay and weeds grew on this ground.

Corn Yields Outstanding

In the 5-Acre Muck Grown Corn Club, the Jachims were beat by only four-tenths of a bushel. They produced 137.9 bushels, while the winners, Surma Brothers of North Judson, grew 138.3 bushels per acre on their 5 acres.

Eighty-five acres were plowed for corn May 10 to 15. The field was then double disked once, harrowed twice, rolled twice, and floated once. The corn was planted with a regular Iron Age potato planter, putting a corn box on the planter instead of a potato hopper and using the fertilizer attachment that puts the fertilizer deep down in the soil. Hybrid corn, fertilized with 250 pounds of 2-8-16 per acre, was planted May 27 in 34-inch rows with 6 inches between kernels. The field was weeded twice and gone over with a two-row tractor cultivator once. In both 1939 and 1940 potatoes were

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Fertilizing for More and Better Vegetables

By H. D. Brown

College of Agriculture, Columbus, Ohio

IN spite of assurances that our fertilizer supply will be adequate for all needs, the present emergency calls for a reexamination of these needs in the light of new demands, new emergencies, and old emergencies only recently recognized.

During World War I, vegetable gardening activities were accelerated primarily because they furnished additional food. Now there is an added motive. The present demand arises from the knowledge that these vegetables are essential for proper nutrition. They are the protective foods essential for health. But all vegetables are not equally healthful. Some varieties of carrots, for example, contain more Vitamin A than others. Fertilizer treatments alter the mineral and vitamin content of many vegetables. Minerals such as calcium, phosphorus, magnesium, iron, and many others are necessary for animals as well as plants. The present demand is for vegetables grown and fertilized so that they provide a maximum of vitamins and minerals for health.

There are many new emergencies. The need for food is not the least of the needs of our allies in this present struggle. Canned vegetables and vegetable concentrates will probably be our contribution to this need. Here again the need for effective and adequate fertilization is essential in order to increase yields to such a point as will make the crops profitable at the higher wage levels. In this and all other similar efforts we must be especially careful not to plow up city lots and other submarginal lands and make the same mistakes that were made during the last World War.

Throughout all these efforts we must not lose sight of the fact that we in America have dissipated the natural fertility of our soils more rapidly than any other nation and the time is near at hand when we will be compelled to do something about it. This perhaps is a poor time to try to build up the fertility of the soil, but we had better lay aside some cash for future use in the hope that there will be an adequate supply of fertilizer available at reasonable prices.

From the foregoing it is probably evident that there are at least two different procedures followed in fertilizing vegetables. In general these methods can be designated as (1) intensive and (2) extensive.

Intensive gardeners apply large amounts of commercial fertilizers and organic matter. Soils cultivated by this group, which includes market gardeners and our most successful potato growers, receive annual applications of from 750 to 2,500 pounds of a complete fertilizer per acre. Market gardeners commonly apply in addition approximately 15 tons of manure per acre annually. Of course applications vary widely in different sections, but a surprisingly effective treatment for these intensively cultivated soils consists of 1,000-1,500 pounds of a complete fertilizer per acre plus 15 tons of manure. Soluble nitrogenous fertilizers are used as side-dressings when needed, and they are commonly needed for leafy vegetables. Potato growers generally secure the organic

matter supply by plowing under green manure crops primarily because it is cheaper than manure and also because manure encourages scab in some instances. The potato growers make a little more effective use of the commercial fertilizer by applying practically all of it in bands along the sides of the rows.

High-quality Vegetables Grown

Vegetables grown on these highly fertile soils are generally of the highest quality. The necessary minerals are present, and the gardeners who are intelligent enough to provide proper food also provide adequate moisture and other requirements which frequently necessitate the use of specialized equipment of various kinds. Their soils are now more fertile than they were 100 or more years ago. These soils, perhaps less than 2,000,000 acres in all, represent the notable exception to the outrageous depletion of our natural resources of soil fertility in the United States. On these soils it is not so important to wrangle over fertilizer analyses. Enough is applied for the needs of all crops and the omission of an application for an entire year, although not advisable, would probably not greatly reduce the yield.

The other type of vegetable gardening—the extensive type—makes use of poorer soils where more exacting fertilizer practices must be followed for success and where, unfortunately, vegetable production is only a side line and the farmer finds it difficult to master the details essential for success. This is the type of gardening that will probably net the greatest increase in acreage during the present emergency, for canning tomatoes and peas are commonly grown by this type of culture and they represent two vegetables in great demand by our and allied armies.

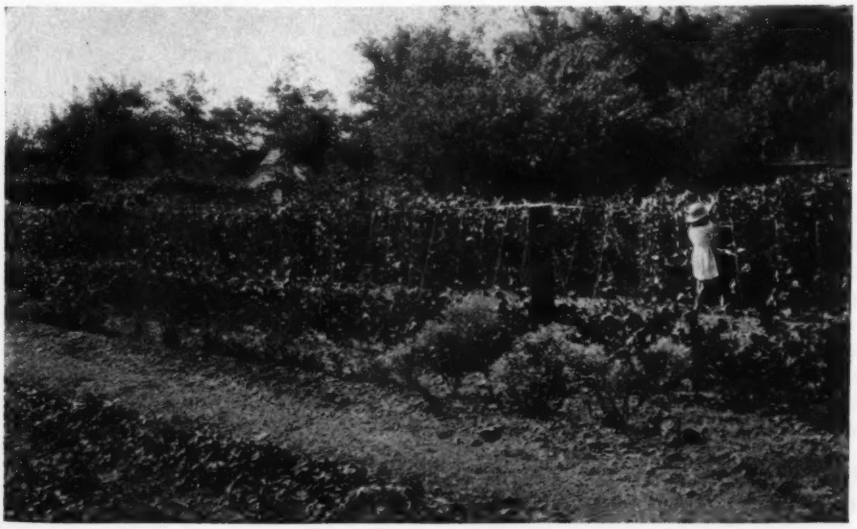
A few rules may be helpful in arriving at a useful fertilizer program.

(1) Acid silt loam soils usually need additional phosphorus for vegetables.

(2) Sandy soils usually need both nitrogen and potash applications before they will produce profitable crops of vegetables.

(3) Muck soils and dark soils usually contain inadequate amounts of potash for successful vegetable culture.

(4) Leafy vegetables, especially spin-



A well-kept garden is a source of many dollars worth of products which may be easily grown on the farm.

ach, require large and constantly available supplies of nitrogen.

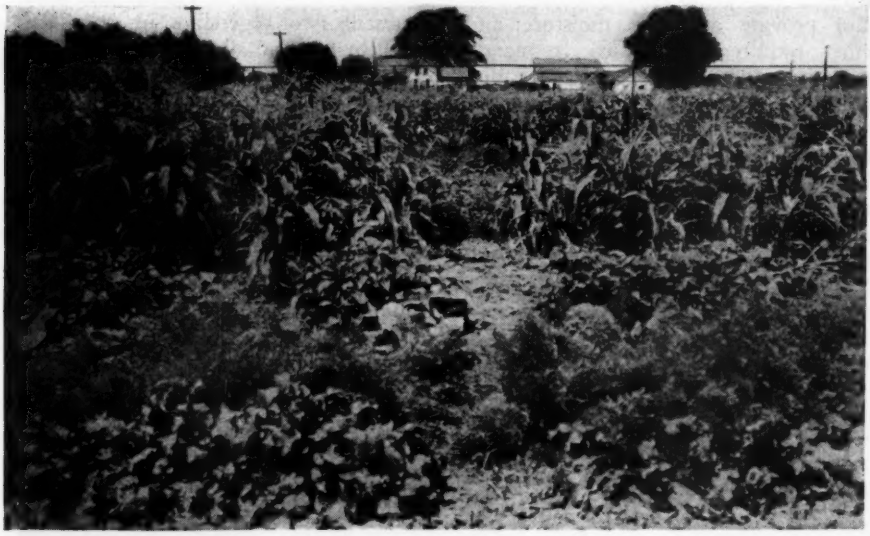
(5) Root crops require especially adequate supplies of potash.

(6) Fruitful crops, tomatoes for example, generally require a liberal amount of phosphorus.

(7) Fertilizer applied in bands at the sides of rows and slightly deeper than the seed is generally more effective in increasing yields than the same amount broadcast.

(8) Most vegetables tolerate and many thrive best in a soil acidity adjusted to lie between pH 6 and pH 7.

these observations must be continued from year to year and future fertilizer applications based upon past observations. Yield data are useful in the same way. Applications of soluble nitrogenous fertilizers made during the growing season are effective for nitrogen hunger if washed down to the roots by rainfall or irrigation water. In general phosphates and potash applications must be made at a depth of 2 to 4 inches before the roots of the plants have made much growth because these fertilizing materials, with a few exceptions, do not move about in the soil.



Fertilizer test with vegetables at the Ohio College of Agriculture. Those on the left received a complete fertilizer and those on the right nitrogen only.

Quick soil tests and the ability to recognize the hunger signs of vegetables are useful supplements to the foregoing rules. Quick soil tests for acidity, phosphorus, potash, and in some instances other elements are made free of charge by the extension workers in some states. They are a valuable supplement, but should not be depended upon exclusively.

More reliable indices can be secured by noting the type of growth made by the plants. Chemical tests of these plants often confirm conclusions drawn from observations. To be most useful,

The hunger symptoms of vegetables have been described and illustrated in many publications. Every vegetable grower should have access to some such publication. The successful grower must be a plant doctor and as such must be able to recognize deficiency symptoms.

Nitrogen hunger is characterized by stunted plants that have light green to yellowish leaves on the older portions. The entire surface of the leaves becomes yellow without the presence of dead spots as is the case if the yellowing is caused by insect or disease attacks.

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Response of French prune trees to potash in Santa Clara Valley district in northern California. Untreated (left) and potash treated (right).

Prune Trees Need Plenty of Potash

By M. E. McCollam

San Jose, California

THE very unfavorable situation of the prune grower has been changing rapidly under the tremendous war activity, and the dried prune is again being recognized as a concentrated food with high nutritional values, having the added advantage of being a non-perishable product easily shipped and stored. The price has risen to 4½ cents per pound, and the outlook for the grower has taken a distinctly brighter hue.

The major portion of the country's dried prune crop is produced in California. This consists of an average annual production for the State of 198,600 tons out of a national production of 225,000 tons. For a good many years the grower has had poor returns for his crops. The export market in Europe was lost, and a troublesome surplus had to be dealt with each year. Prices dropped to around one cent per pound for dried prunes, and the growing end of the industry was on the verge of disaster.

A considerable acreage of prune trees in California has been planted on soil which does not supply the crop with sufficient potassium for best results. In the prune district of the Northern Sacramento Valley the soils in addition to having inadequate potash-supplying power may also have a high fixing power for potash. Along with this the prune trees set unusually heavy

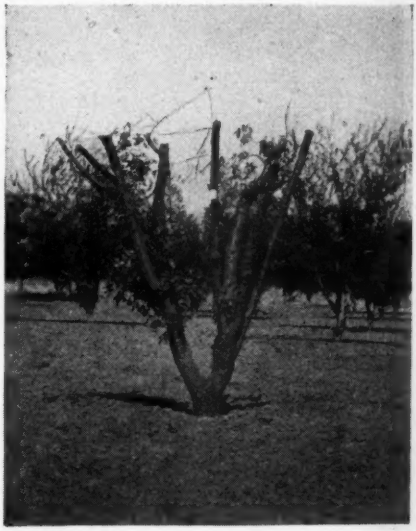
crops of fruit, 10 tons fresh yield per acre being quite common. When three such unfavorable factors as inadequate potash in the soil, serious fixation of any potash applied to the soil, and heavy fruit sets exist together, the tree suffers, of course.

On top of this, extremely hot spells occur in the Sacramento Valley during the period of fruit formation and ripening, which undoubtedly add to the physiological disturbance in the trees. On some soils with a particularly high power to render potash unavailable to the plant, the prune trees are severely injured, and heavy applications of potash are of no avail. The foliage on an entire limb may scorch, and the limb die. Apparently healthy trees may go to pieces in a single season. About the only help in these cases is to prune out some of the fruiting wood or to thin the fruit so as to greatly decrease the fruit load.

On other soils in the Sacramento Valley where the potash situation is not so acute, applications of potash may be effective in supplying enough potash to carry the crop through and prevent tree damage. In one such case under observation heavy potash applications made years ago to plots of prune trees still show very marked effects in tree and fruit, whereas comparable trees which have not received potash are in very poor condition.

The most important prune district is Santa Clara Valley, and here, although soils low in potash supply also exist, we find a very different picture. The trees do not set as much fruit, and six tons fresh yield per acre are considered a very good crop for the district. The climate is more moderate, and while summer hot spells occur, they are not so prolonged nor so intense as in the Sacramento Valley. The soils which are low in potassium supply do not seem to have the property of "locking up" potash applications to a serious extent. Small amounts applied to soils have been effective.

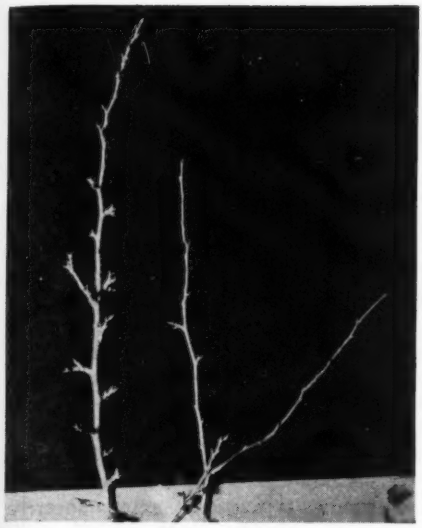
Prune trees growing on extremely potash-deficient soils in Santa Clara County are stunted, and it is not uncommon to see trees which are more than 30 years old no larger than good 6- or 7-year-old prune trees. The leaves show tip and marginal scorch, are small in size, and chlorosis of the leaf tissue is quite apparent. There is a certain amount of die-back of the smaller wood each year. This condition becomes very bad in the tops of the trees, but the trees do not die. They have adapted themselves to the soil condition and linger on, bearing light crops of mostly poor quality fruit. A large part of the fruit crop "sunburns" each year.



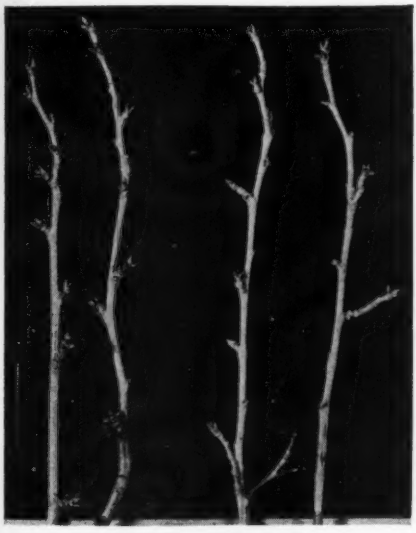
Prune orchard in Chico, California, district suffering from die-back due to potash deficiency. Note tree in foreground almost gone because of 'potash hunger."

Fertilizer tests on prune trees have been carried on with growers in the various prune districts for the past 25 years. It has been found that this fruit utilizes relatively high amounts of potash, as fruit crops go, and generally responds well to this fertilizer.

Several tests in recent years have been particularly interesting, not only because of the response of the crop to potash applications, but also because analyses of the leaves have been made on both potash-treated and untreated trees. These leaf analyses have shown



Comparisons of prune twigs from potash-deficient soils. Nitrogen-potash treated (left) and nitrogen only (right).



that potash-treated trees build up a higher content of potash in the leaves along with their increased production of fruit. The potash in the leaves of untreated trees stays at about the same level, and if this level is low, the trees either show die-back and leaf scorch or produce poor crops, or may show a combination of both of these troubles.

On the Rasmussen orchard at San Martin, California, fertilizer test plots have been carried on with both French prunes and sugar prunes. The soil type is Pinole loam of which there are about 3,000 acres in Santa Clara Valley. Some very low readings for potash have been noted on this soil type; while in some other localities on the same soil, tests have shown the potash to be in medium good supply. Because of a rather tight subsoil condition at varying depths, the root systems of the trees may be restricted in their feeding area. While trees on this soil body do not show severe potash deficiency symptoms, quite generally they are small in size and yields are therefore limited.

The fertilizer treatments compared were sulphate of ammonia, and sulphate of ammonia with sulphate of potash. The average yields of the treated and untreated plots and the 1941 yields are shown in following tabulations.

Average Yield of French Prunes for 4 Years and 1941 Yields Separately

Treatment	4-year average yield per acre, lbs. (dried)	1941 yield per acre, lbs. (dried)
No fertilizer	2,282.7	2,844.0
Sulphate of ammonia	2,632.5	2,979.0
Sulphate of ammonia and Sulphate of potash	4,210.5	5,706.0

It is of great interest to note the French prune leaf analyses for potash in 1941, keeping in mind that the yield of dry prunes was about doubled by the potash treatment. The leaves on the trees treated with sulphate of ammonia, without potash, contained 0.91% potassium; those on the trees treated with potash in addition to the sulphate of ammonia contained 1.94% potassium. These results of leaf analyses show that the large increase in

the leaf content of potash went hand in hand with the great increase in fruit production obtained.

Average Yields of Sugar Prunes for 4 Years and 1941 Yields Separately

Treatment	4-year average yield per acre, lbs. (dried)	1941 yield per acre, lbs. (dried)
No fertilizer	1,473.7	1,422.0
Sulphate of ammonia	1,562.6	1,498.5
Sulphate of ammonia and Sulphate of potash	2,140.3	2,025.0

Although a substantial increase in yield of sugar prunes occurred with the potash treatment, this increase was not as large as in the case of the French prunes. Again, leaf analyses in 1941 corresponded to the results obtained in yield of fruit. The trees treated with only sulphate of ammonia had a potash content in the leaves of 1.06% potassium, while those treated with sulphate of potash in addition to the sulphate of ammonia had increased their leaf content to 1.72% potassium.

Additional tests have been carried out on the Otto orchard of French prunes at Morgan Hill, California. The main soil body in this orchard is classed as Rincon clay loam. In parts of the orchard a soil classed as Conejo clay adobe extends into the Rincon clay loam. Soil tests have shown the Rincon soil to be quite low in potash, and some low tests have been obtained on the Conejo soil. Poor drainage during some years of heavy winter rainfall undoubtedly has restricted root development of the trees in this orchard.

In a large part of the orchard the trees show severe potash deficiency symptoms, typified by small, severely scorched, and chlorotic leaves and small, "sunburned" fruit. The orchard has been irrigated at times and has been supplied with nitrogen and phosphorus fertilizers.

In 1936 four trees in a badly affected part of the orchard were treated with five pounds of sulphate of potash per tree. This treatment was repeated

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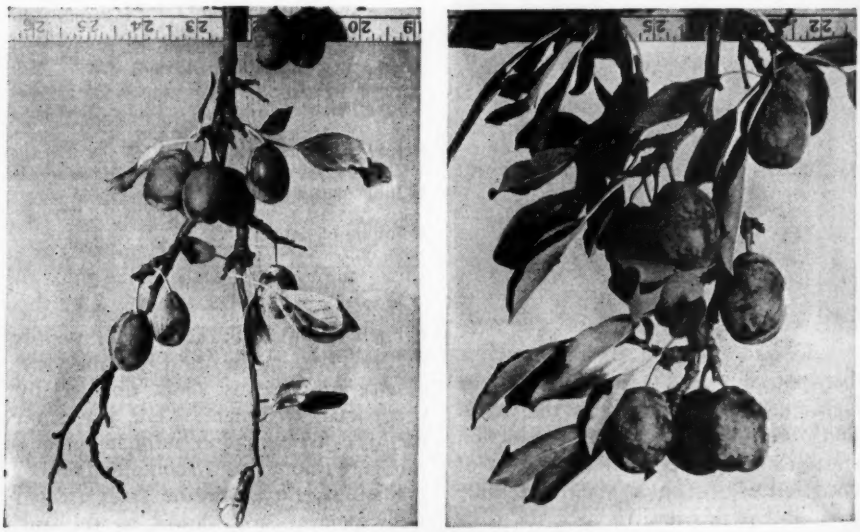

Comparison of French prunes grown on potash-deficient soil. Without potash (left); note twig die-back, leaf scorch, and small sized fruit. Treated with potash (right) for several years at the rate of 2½ pounds actual K_2O per tree; leaf potash has been increased 300% in these trees but is still in the deficiency range.

W. M. Ross Conserves His Soil Fertility

By F. J. Hurst

Agricultural Adjustment Administration, Jackson, Mississippi

DESPITE the difficulties which have beset agriculture during the past two decades, you will find one or more successful farmers in practically every rural community—farmers who have developed their farms and improved their homes. It is both interesting and profitable to study such farms, one of the most successful of which is owned by W. M. Ross, who lives about eight miles north of Jackson in Hinds County, Mississippi.

Effective conservation of the soil and economical production of feed, major problems on nearly every farm, have been solved on this farm by the development of a scientific cropping system that puts the maximum acreage of all open farm land in sod-farming, soil-holding, feed-producing crops. And these crops are scientifically fertilized and economically harvested, either with labor-saving machinery or by grazing with dairy cows.

Agricultural research has shown that next to good forest cover, a thick sod of grasses and clovers is the most effective means of controlling erosion. A dense growth of grasses and clovers traps rainfall, slows water run-off, holds soil fertility, and at the same time produces the cheapest feed for all kinds of livestock. So, on the Ross farm you will find verdant pastures of luscious grasses and nutritious clovers, extensive meadows of luxuriant lespedeza, acres and acres of oats in the shock, and fields of tasseling corn and fruiting soybeans.

Of 615 acres of open farm land, Mr. Ross has 215 acres in improved permanent pasture; 120 acres in oats, 90 acres of which were seeded to lespedeza in February for hay, and 30 acres reserved for planting broadcast to Avoyelles soybeans after the oats were harvested; 50 acres of permanent lespedeza meadow; 25 acres of broadcast Laredo soybeans; 150 acres of corn interplanted to Biloxi soybeans; and 55 acres of cotton. Thus, only about one-third of all open farm land on this farm is devoted to cultivated row crops, and on this acreage either a summer or winter legume is grown. Bur clover is being grown for winter cover on cultivated land, and the acreage of this popular winter legume is being increased as the supply of home-grown seed is increased.

Follows Approved Methods

The most approved methods are followed in improving permanent pastures and in growing and harvesting field crops. There are seven well-fenced, well-kept permanent pastures on the farm to provide for rotational grazing and the best management of workstock, the milking herd, dry cows, and young dairy cattle.

The pastures are seeded to dallis grass, bermuda grass, carpet grass, lespedeza, hop clover, and white clover. Basic slag has been applied on a portion of the acreage in pasture, and recently Mr. Ross bought a carload of ground limestone for use on his permanent pastures. All pastures are mowed at least twice each year to control weeds. The productivity of the pastures is shown in the fact that they provide grazing for nearly one animal unit per acre from March through November.

Efficient use of fertilizer is playing an important part in maintenance of soil fertility and profitable production of crops. Mr. Ross says he "has taken

the guess out of fertilization" by having his soils tested and by making a close study of results obtained from the use of fertilizers under crops on the farm. He says his soils are deficient in lime and potash, and his fertilizing practices are designed to meet the need for these two plant-food elements.

For cotton, Mr. Ross applies 400 pounds per acre of 8-10-10 in the drill when the land is bedded two to three weeks before planting time, and 100 pounds nitrate of soda and 35 pounds of muriate of potash mixed as a side-dressing soon after the cotton is chopped out.

For corn he uses 200 pounds per acre of 8-10-10 before planting and side-dresses with 100 pounds of nitrate of soda when corn is knee-high.

The 120 acres of oats, which this year yielded nearly 7,000 bushels, received an application of 200 pounds per acre of basic slag and nitrate of soda mixed in the proportion of 200 pounds of slag to 100 pounds of nitrate of soda. The mixture was applied broadcast with grain drill in February, just before lespedeza was seeded on the oats. Following application of this fertilizer, a rotary hoe was run over the oats to loosen the packed soil and hasten germination of the lespedeza seed, which was sown at the rate of 20 pounds per acre.

Biloxi soybeans are grown in all corn, and the entire crop—corn and beans—is saved. The corn and beans are harvested with a corn binder, and the stalks are run through a shredder. This gives a large supply of roughage, which is used for wintering young cattle and dry cows.

Mr. Ross has developed one of the highest producing dairy herds in the State. Although he has 175 head of dairy cows, he provides abundant pasturage and raises plenty of feed for them. Only a small quantity of concentrate feed is bought, and this is of the highest quality. He keeps a daily record of the production of each cow and feeds each animal concentrate according to her milk production. This assures him maximum production of milk from each cow at a minimum cost of feed.

His dairy barns and milk houses are models of sanitation. The milking barn is kept scrupulously clean. The cows are brushed thoroughly before

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Mr. Ross in one of his fields of lespedeza which was 18 inches high on July 11. The yield on 140 acres averaged 3½ tons per acre.

Tobacco Growers Aim At Domestic Market

By Jack Wooten

Agricultural Extension Service, Athens, Georgia

TOBACCO growers should strive for domestic grades of leaf this year, in the opinion of J. M. Carr of the Bureau of Plant Industry who is stationed at the Coastal Plain Experiment Station, Tifton, Georgia. Every effort, he declares, should be made to grow the thin, luggy, ripe grades required by domestic tobacco manufacturers. He adds that if such an effort is made, there will still be produced sufficient quantities of export grades to satisfy the small export trade remaining.

Good plants transplanted to the field at the proper time are essential to good quality. Plants require proper heat, light, and moisture conditions and liberal quantities of plant food for early and rapid growth, according to Mr. Carr. Slopes to the south or southeast are warmer and promote more rapid plant growth than those facing north or west, because the sun strikes them earlier in the morning and more directly.

One year's tests on different slopes indicate that a south slope will produce 3 times as many early plants as the same degree of slope to the north and about 50 per cent more early plants than east or west slopes, the tobacco expert points out. Plant beds can also be made warmer by natural or artificial windbreaks on the north and northwest sides. Light conditions in most cases may be improved by cutting all trees that shade the south and east sides of seedbeds.

Attempts have been made experimentally to increase the light intensity on seedbeds by the use of aluminum-painted reflector boards placed so as to reflect the light downward on the plants. These boards did increase the light intensity on the beds and thereby increased the heat, resulting in more rapid plant growth. However, the soil dried out rapidly, necessitating frequent watering and very close attention.

Except where permanent water systems are available the moisture factor is largely one of rainfall, but many things may be done to make best use of the natural water supply or avoid damage from it. Since tobacco seed will not germinate except when the surface of the seedbed is moist, trouble is often experienced in securing a stand of plants. This was one of the biggest factors delaying the 1941 crop.

Aids to Germination

Germination may be helped materially by packing seedbeds firmly and to a smooth surface. The best way to accomplish this is with a heavy roller. Tramping by foot leaves the surface irregular and subject to rapid drying. However, heavy irregular packing is to be preferred over light smooth packing. Artificial watering should be done with some form of sprinkler rather than with a pan or bucket. All beds should, of course, be ditched to prevent the accumulation of excess water in periods of heavy rainfall.

Speaking of fertilization of tobacco, Mr. Carr says: "While plant food or fertilizer is essential to plant growth, it is not any more so than proper heat, light, and moisture conditions. Experiments have shown that tobacco seedbeds require approximately 2 pounds per square yard of a fertilizer analyzing 4

to 5 per cent nitrogen, 8 per cent phosphorus, and 3 per cent potash. Nitrogen is required in comparatively large quantities, but the heavy rates of fertilizer applications made on tobacco seedbeds make it possible to hold the potash content of such fertilizers to a rather low level.

"All potash in tobacco seedbed fertilizers should be derived from sulphate of potash or some form other than muriate. Practically all nitrogen applied to seedbeds prior to seeding should be in a form other than nitrates. Nitrates leach readily and are usually gone by the time the seed germinates and the plants have become established. However, nitrates make excellent top-dressers due to their solubility and availability and can be best applied in a solution of 5 pounds nitrate of soda or similar material in 50 gallons of water for every 100 square yards of seedbed area. Such an application should be followed with 50 gallons of water to wash the solution from the plants into the soil where it can be utilized."

Domestic Types Desired

In the seedbed, Mr. Carr adds, vigor and rapid growth are highly desirable, and quality is not a factor. However, after the plants are transferred to the field, quality becomes the primary consideration. The present demand, he reiterates, is for domestic types of tobacco which are luggy, thin, and ripe. "Highly colored, clear-leaf tobacco formerly going to high-class export trade is not in so strong demand as it was prior to the outbreak of the present war. We must, therefore, strive to produce the type most in demand and alter our methods of production accordingly."

There are a number of factors governing the type of tobacco produced, many of which the grower may control in part or entirely. Rainfall is the most important factor governing quality, and is the only factor over which the grower has no control. However, the farmer may select soils that are low enough not to suffer too much in temporary drought and yet rolling enough to drain properly during wet weather.

"Growers may be rather limited in the choice of soil for tobacco on their farms, but there is always some soil on every farm that is better suited to tobacco than others," Mr. Carr says. "These soils should be selected and a systematic rotation established with a view to disease control and the production of quality. From the standpoint of both quality and disease control, a three-year rotation of tobacco the first year, Spanish peanuts the second year, oats followed by a natural growth of weeds the third year, and back into tobacco the fourth year is as good as we have tried."

Quality is also governed to a considerable degree by the variety used. Experiments at the Georgia Coastal Plain Experiment Station have shown that Gold Dollar, Yellow Mammoth, Virginia Bright Leaf, and Bonanza are all excellent varieties. New varieties are being developed in which it is hoped to incorporate higher yields and better quality, together with some degree of disease resistance.

"Next to seasons and soil, fertilizers probably play the most important role in the production of quality," according to this tobacco specialist. "Overfertilization, especially excessive applications of nitrogen, quickly destroys quality. On the other hand, underfertilization reduces yield but will produce good quality. It is therefore much better to underfertilize than to overfertilize. Tobacco fertilizer formulas should contain the various plant-food elements in rather definitely balanced ratios. Under most conditions these fertilizers should contain 3 per cent nitrogen, 10 per cent phosphorus, 10 per cent potash, 2 per cent magnesia and 2 per cent chlorine.

"Certain quantities of calcium and sulphur are also required but are usually supplied in sufficient quantities by materials now in common use. On soils having a comparatively high potash

(*Turn to page* 37)

PICTORIAL

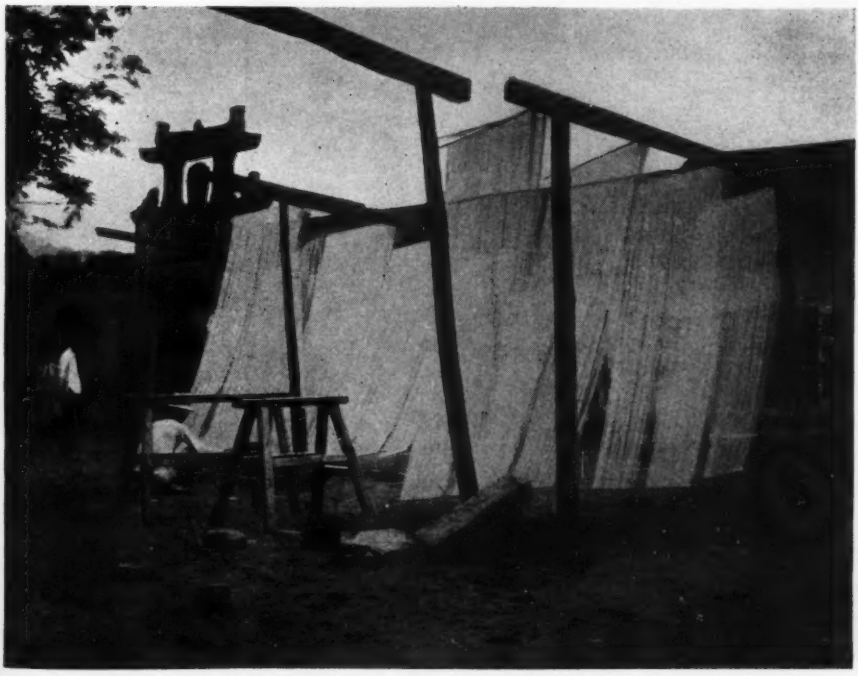
Yassuh, we'se gittin an early start on all we wants to eat this year.

Above: Tea pickers on their way home; Pengalengan Plateau, Java.

Below: Rice terraces in Bali; intensive farming feeds thousands.

Above: Work animals in the Philippines also provide transportation.

Below: Drying noodles at a factory near Amoy, southeastern China.



Above: Floyd Hiner (left) and E. W. Doubet, twin Corn Kings at the International Hay and Grain Show, Chicago. This is the first time in the history of the Exposition that the judges could not find one sample of corn on which to agree for the Grand Championship, so today both men are possessors of the Purple Ribbon. Mr. Hiner farms 160 acres in Rush County near Lewisville, Indiana, and Mr. Doubet farms 340 acres in Peoria County near Hanna City, Illinois. Both men produce about 60 acres of hybrid corn and both have been Reserve Champions but never Grand Champions at the International Show. Both also use 125 pounds of fertilizer per acre on their corn, but Mr. Doubet prefers a 2-16-8 analysis and Mr. Hiner a 2-12-12.

Left: "King Cotton" put up in bales like this commands honor for grower and handler.

The Editors Talk

The Forty-third Convention

Geared to war-time efficiency, the Association of Southern Agricultural Workers held its 43rd annual convention in Memphis, Tennessee, Feb. 4-6. Although the attendance, more than 800, was smaller than in some previous years, those present considered with a marked seriousness the problems of "Southern Agriculture in a Changing World," the theme set for all general and group conferences. This theme undoubtedly was picked in early preparations for the convention and before the United States entered the war. However, there was no mistaking the quick translation of "Changing World" to "Victory Program" in any of the sessions. The South is up in arms and ready to direct all of its research and advisory work into channels which will be the most effective in meeting the demands of the Government.

Today the South is much better prepared for more home gardens, more livestock and livestock products, increased production of vegetable oils, more fruits and vegetables, and other agricultural products with which to face our national crisis. The emphasis on the diversification or "live-at-home" program, started in these conferences several years ago, has borne fruit. The attention given its long-cropped soils is yielding results in rebuilding fertility and stopping erosion.

In connection with the ever due regard which should be accorded soil fertility, one of the resolutions passed by the convention related to fertilizers:

> "That the appropriate Federal agencies be advised of the inability of the South to produce needed crops without liberal quantities of fertilizers and that they be urged to give this fact special consideration in the allocation of nitrogen materials and mixed fertilizers; that fertilizer manufacturers make every effort to sell the grades that are recommended by the agricultural colleges of the South and grades that do not contain inert or worthless filler; and, further, that the agricultural agencies in cooperation with fertilizer manufacturers make every effort to reduce the total number of grades to the minimum number required to meet crop needs in the States where such action has not already been taken; that farmers be urged to order and receive their fertilizer in an orderly manner throughout the season and to employ the most efficient methods of application in order to obtain maximum yields from the fertilizer used."

New Orleans was chosen as the meeting place next year. It is to be hoped that nothing will prevent this gathering of representatives of all branches of agricultural science. The convention is needed, for it is "common ground" for all the forces so conscientiously working for the constant improvement of the South—the Nation's largest and most important source of agricultural products.

"In the Clover" A New Motion Picture

"In the Clover" is the title of a new motion picture made by the American Potash Institute in cooperation with agronomists of Northeastern agricultural colleges. Copies of the film are now ready for loan by the Institute to county agents, vocational teachers, responsible farm organizations, and members of the fertilizer trade for showings to interested groups. Requests should be directed to the Institute, 1155 Sixteenth St., Washington, D. C. To insure bookings this spring, alternative dates of showing should be given wherever possible. The picture is in color, silent, 16 mm., on 400 ft. reels, running time 45 minutes, and tells a human-interest story of the value of this crop in successful farming in the Northeast.

Ladino clover is a relatively new crop in America. Like any other new thing which promises to be of value to a large number of people, this crop has aroused an interest that is growing by leaps and bounds. Established on the irrigated lands of the Pacific Coast early in this century, Ladino is now being grown in many States in the Northeast. It can be grown in any area of the country having a normal rainfall of two inches or more per month, and particularly in valleys which get the effects of seepage. Strains of this clover, such as Louisiana clover, have shown marked adaptability in Southern regions. More research and greater refinement of plant selection may extend the growing of this legume to every important livestock growing area.

In the January issue of this magazine, an article by S. D. Gray reviewed the introduction and early development of this crop and outlined the important essentials for successfully growing it in the Northeast. Reprints of this article are available upon request.

For what avail the plow or sail,
Or land, or life, if freedom fail?

RALPH WALDO EMERSON

Garden Fever

As the days lengthen and the warm sun draws people outdoors, "garden fever" will descend upon us. The "temperature" will rise to much greater heights this year due to the war and the publicity given the value of home gardens and the Government's greatly increased vegetable goal. With no disparagement to the good effects of garden fever at any time and the very commendable enthusiasm which is currently being aroused, the experienced will realize that in some instances a sedative should be applied.

Unwise gardening endeavors are to be discouraged. Out of the National Victory Garden Conference held in Washington, D. C., in December came the recommendation that all back yards should not be plowed up for the sake of growing a few vegetables. Such a procedure would waste limited seed supplies, fertilizer, and other materials needed by farmers and commercial vegetable growers. Community plots or large-scale school gardens which can be located on fertile soil and in accessible places, with supervision and adequate instruction and help available, should be encouraged.

Considerable tact undoubtedly will have to be employed by advisory forces in directing garden enthusiasm. It will be an added burden to their already crowded schedules, but one which will prove immensely satisfying if it results in the kind of increased vegetable growing which the Government wants.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

¶ The soils of Idaho have not been farmed so long as those in the East and South, but already they are beginning to show indications of fertility depletion due to continued cropping without replacement of the plant foods used. Agricultural authorities are alive to the situation and have conducted many experiments to determine the fertilizer needs of the soils of the State. Recommendations based on this work are given in Idaho Agricultural Extension Bulletin 138, "Fertilizers for Idaho Farms," by H. W. E. Larson. The author points out that markedly lower yields are now obtained in many parts of the State compared to 15 or 20 years ago. One of the reasons for the rapid depletion of soil fertility is the favorable climate, resulting in high yields with consequent greater removal of plant foods.

The author gives the amounts of nitrogen, phosphoric acid, and potash removed by a large number of crops, discusses briefly the functions of the principal plant foods and sources of plant foods in fertilizer materials, and gives recommendations for the important crops grown in the various parts of the State. Available phosphorus is low in many of the soils and this is reflected in the rather general recommendation of phosphorus fertilizers. Many of the soils are better supplied with available potash, but the author states that the large amounts of this nutrient removed by most crops will increase the need for potash. Already a number of soils are showing a response to this nutrient. Nitrogen is needed on soils low in organic matter that are not having legumes turned under regularly. Some of the high-lime soils are deficient in iron, and boron has also been found to give beneficial results, especially on alfalfa growing on soils in the northern part of the State. All farmers and agricultural advisers in Idaho will find this bulletin very useful, as will others interested in fertilizer usage in the Western States.

¶ Remarkable results from the use of borax on alfalfa are described by T. B. Hutcheson and R. P. Cocke in Virginia Experiment Station Bulletin 336 entitled "Effects of Boron on Yield and Duration of Alfalfa." The authors describe the typical yellowing on alfalfa due to boron deficiency and differentiate between yellowing due to this cause and other causes such as leafhopper injury, potash deficiency, or other factors causing a weakened plant. Results of experiments conducted at several locations in the State in which marked increases were obtained in yields of alfalfa due to the application of 10 to 20 pounds of borax per acre are given.

Of possibly even greater importance is the effect of borax on the life of the stand. In many places in Virginia most of the alfalfa dies out the second year and by the third year has almost entirely disappeared. This dying out is prevented by the addition of borax. The work has not yet progressed to the point where it is possible to state how long the stand is prolonged by the borax application. The authors state that in the experiments conducted for

the past two years where no borax was applied alfalfa has almost completely died out, while where the borax was applied the alfalfa stand is healthy and vigorous.

An experiment on the effects of high applications of borax showed that yields were increased slightly with additions up to 60 pounds per acre and even with applications up to 100 pounds per acre there was only a slight depressing effect. The authors conclude from this that there is little danger of building up boron toxicity in the soil by the recommended application of 10 to 20 pounds of borax per acre annually. They do suggest that until further information is obtained on the carry-over effects of borax soils treated with borax should not be planted to dark tobacco the following year.

The influence of borax on the setting of seed on alfalfa also was investigated with very marked differences being obtained. Where the alfalfa was treated with borax there was a good set of seed, while where no borax was applied there was little or no seed set.

As a result of this work the authors recommend that boron deficiency on alfalfa soils may be corrected by applications of 10 to 20 pounds of borax per acre, either when the alfalfa is seeded or as a top-dressing in the spring or after any cutting. They state that the borax will increase the yield on boron-deficient soils, stimulate seed production, and increase thickness and duration of the stand. These results are of great importance to alfalfa growers. When borax is used along with other cultural practices, it apparently will be an important factor in obtaining and keeping good alfalfa fields.

¶ While the use of boron as a plant nutrient is a comparatively new development, interest in this subject has been very great and widespread within recent years and a remarkably large volume of literature has appeared. It is important that those interested in this field should occasionally survey the entire situation to learn the trends in the information being obtained and what gaps in our knowledge need to be filled. E. L. Overholser of the Washington Agricultural Experiment Station has made an important contribution of this type. He prepared this for the symposium on boron deficiency of horticultural crops held during the meetings of the American Association for the Advancement of Science at Pasadena, California, June 1941. His paper has been issued as an unnumbered mimeographed publication of the Experiment Station. He quotes from more than 150 references, briefly giving summaries covering the field of boron usage as a nutrient and suggestions of possible future lines of investigation.

"Annual Report of Commercial Fertilizers and Agricultural Minerals, July 1, 1940, to June 30, 1941," Div. of Agr., Denver, Colo., Nov. 1941.

"Fertilizers for Idaho Farms," Agr. Ext. Serv., Moscow, Idaho, Bul. 138, Sept. 1941, H. W. E. Larson.

"1940 Maine Fertilizer Sales," Agr. Exp. Sta., Orono, Maine.

"Fertilizers for Minnesota Small Grains," Agr. Ext. Serv., University Farm, St. Paul, Minn., Folder 101, Oct. 1941, George H. Nesom.

"Fertilizers for Minnesota Corn," Agr. Ext. Serv., University Farm, St. Paul, Minn., Folder 102, Oct. 1941, George H. Nesom.

"Fertilizers for Oklahoma Potatoes," Agr. Exp. Sta., Stillwater, Okla., Bul. B-249, Oct. 1941, Earl F. Burk.

"Commercial Fertilizers—Concerning Fertilizer Usage," Agr. Exp. Sta., Burlington, Vt., Bul. 476, Sept. 1941, L. S. Walker and E. F. Boyce.

"Effects of Boron on Yield and Duration of Alfalfa," Agr. Exp. Sta., Blacksburg, Va., Bul. 336, Aug. 1941, T. B. Hutcheson and R. P. Cocke.

Soils

¶ It has long been the hope of farmers and farm advisers that some day it would be possible to take a sample of soil, analyze it, and determine what it lacks to produce high yields of crops. Progress has been made in this direction, although investigators have pretty well given up the idea that it will be possible to analyze a soil chemically and from this alone tell just what is needed to grow a big crop.

The information that can be expected from testing soils is briefly discussed by F. E. Bear in New Jersey Agricultural Experiment Station Circular 417, "Testing Soils for Deficiencies." Dr. Bear points out that soil tests have now been worked out to the point where a careful investigator can determine the relative amounts of nutrients present and from this, based on his experimental work in the field, made a recommendation as to the lime and fertilizer likely to give good results. These results, however, cannot be guaranteed since weather, a factor which cannot be anticipated, plays an important part. The soil sample also may be a factor which can throw off the investigator since an improper sample may give rather misleading results. Directions on how and when to take a sample are given and also a resume of the tests that are made on the soil. It is pointed out that the test for acidity is the most important since the proper soil reaction is the first thing that must be corrected if good results are to be obtained.

Dr. Bear states that nearly all soils in New Jersey lack phosphate and that an increasing number are becoming deficient in available potash. The possibility of the need for magnesium, manganese, and boron also is discussed. Supplementing soil tests with plant tissue tests and with observation of nutrient deficiency symptoms on plants is suggested. By using all three methods of determining the fertility status of the soil, best results are most likely to be obtained.

¶ An inventory of the soils of Michigan is made by J. O. Veatch in Michigan Agricultural Experiment Station Special Bulletin 231, entitled "Agricultural Land Classification and Land Types of Michigan." The large soil groups are described, and a table of all the soil series so far mapped gives a brief description of the series, the general character of the land, its agricultural use and value, and the approximate area of each particular kind of soil. The proportion of good, fair, marginal, and poor soils in each county, and the areas of land suitable for growing the important crops in the State are given. This bulletin would appear to be an excellent basis for planning agricultural programs in Michigan.

"Warren County Soils," Agr. Exp. Sta., Urbana, Ill., Soil Rpt. 70, Oct. 1941, Herman Wascher and R. S. Smith.

"Agricultural Land Classification and Land Types of Michigan," Agr. Exp. Sta., East Lansing, Mich., Sp. Bul. 231 (Rev.), Oct. 1941, J. O. Veatch.

"Testing Soils for Deficiencies," Agr. Exp. Sta., New Brunswick, N. J., Cir. 417, Sept. 1941, Firman E. Bear.

"Selenium Occurrence in Certain Soils in the United States, with a Discussion of Related Topics: Sixth Report," U. S. D. A., Washington, D. C., Tech. Bul. 783, Oct. 1941, H. W. Lakin and H. G. Byers.

"1942 Agricultural Conservation Program for the North Central Region," U. S. D. A., Washington, D. C., NCR-601, Dec. 1941.

"Soil-building Practices, 1942 Farm Program," U. S. D. A., Washington, D. C., NCR-601, Supp. 1, Jan. 5, 1942: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, Ohio, South Dakota, and Wisconsin.

Crops

¶ Coming at a time when the agricultural program calls for a greatly increased acreage and production of peanuts, Georgia Experiment Station Circular 131, "Cultural Methods for Growing Peanuts," by U. R. Gore is a helpful contribution to the war effort. Brief and practical information on all the phases connected with growing this crop are given. The author points out that while the crop is now grown mainly in the Coastal Plain section, there is no reason why it cannot be grown in the Piedmont and other sections of Georgia.

Seed should be carefully selected and treated before planting. The fertilization of the crop is very important since peanuts make a very heavy drain on the nutrient supply of the soil. While the author states that on fertile soils previously well fertilized no fertilizer may be needed for peanuts, it should be kept in mind that proper fertilization is not only important for the peanut crop itself but for the following

crop since experimental work at other stations has shown that unless peanuts are well fertilized and especially with potash the crop following peanuts will suffer. Dr. Gore states that on most soils 300 pounds of a 3-8-8 fertilizer with an extra nitrogen top-dressing is a good general recommendation. Another method of fertilization is to apply superphosphate at planting time and use a nitrogen-potash top-dresser. Care should be taken that the fertilizer does not come in contact with the seed. All peanut growers, and certainly those who are not regularly growing the crop but are doing so this year under the expanded acreage program, could well afford to have this circular for guidance.

¶ Sweet clover is a legume which in many parts of the country is often neglected and even regarded as a weed. That it is unfortunate the many good qualities of this vigorous legume are not more fully understood is brought out by E. N. Fergus, R. Kenney, and W. C. Johnstone in Kentucky Extension Circular 366, "Sweet Clover for Kentucky." The authors state that if the soil is not acid and is fairly well supplied with minerals, sweet clover will grow under conditions unfavorable to many other plants. It will cover gullies, and what is even more desirable it favors the growth of grasses so that the soil soon becomes permanently covered and protected against erosion. Sweet clover can be used as a green manure crop, as a pasture crop, and for hay. If the soil is acid, it should be limed and appropriate amounts of phosphate and potash should be applied before seeding the crop. While sweet clover is a soil-improving crop so far as nitrogen is concerned, it makes heavy demands on the phosphate and potash in the soil. The authors bring out that potash especially may become deficient even though barnyard manure is returned, unless potash is included in the fertilizer for the crop. Practical directions on how to grow the crop and how to utilize it are given in the circular.

¶ Another neglected legume is Ladino clover. Although it has been known for some years, only within the last 5 or 10 years has any serious attention been given to it in this country. It is related botanically to ordinary white clover but is much taller. A series of experiments which give much valuable information on growing Ladino clover and how best to take advantage of its desirable features is described by B. A. Brown and R. I. Munsell in Connecticut (Storrs) Agricultural Experiment Station Bulletin 235, "Pasture Investigations." Experiments were conducted over a period of 10 years and covered a wide range of factors involved in growing the crop. It was found that Ladino clover seeded alone did not yield as much forage as mixed Ladino clover and grass. Under conditions in Connecticut, orchard grass and timothy are better companion crops than the bluegrasses or bent grass. If the mixture was to be cut for hay, timothy was preferable, while if the mixture was to be used for pasture, orchard grass appeared better. A combination of grasses and Ladino clover appeared to be effective due to the grasses preventing winter heaving and killing of the clover. No advantage was found with a mixture of grasses and Ladino clover over a single grass with the clover. Trials in seeding Ladino clover on cut-over land or sod without cultivation have on the whole been unsuccessful.

Ladino clover can withstand less favorable conditions than alfalfa, but for good yields and long-lived stands the soil should not be too acid and mineral fertilization should be provided. It is therefore recommended that on acid soils a generous liming be given. In order to take care of the high mineral requirements of Ladino clover and replace the rather large amounts of nutrients removed in the crop, good applications of phosphate and potash are recommended. It is stated that a good crop of Ladino clover and grass mixture may remove from the soil about 40 pounds of phosphoric acid, and up to 100 pounds of potash

per acre annually. The fertilization should replace about these quantities of plant food. This would be equivalent to 200 to 300 pounds of superphosphate and 175 pounds of high-grade muriate of potash, which quantities are recommended by the authors. If very heavy applications of manure are made, these quantities might be reduced. The authors conclude that there is no need for applying nitrogen to fields having one-third or more of the stand composed of Ladino clover. So far none of the minor elements tried has given any beneficial results.

The authors strongly recommend that close and continuous grazing be avoided if a long-lived stand of Ladino clover and grass mixture is desired. Intermittent grazing with ample rest periods for the clover and grass to make good growth is strongly suggested. While no actual feeding trials with Ladino clover were conducted by the authors, they noticed that the animals seemed to like it very much. Chemical analyses indicate that it should have a high feeding value. The grass growing along with Ladino clover profits by the presence of the clover and also has a higher feeding value than ordinary grass growing alone.

¶ A timely publication is "The Year-round Home Garden" by R. O. Monosmith, issued as Mississippi Extension Bulletin 121. This bulletin gives excellent and very complete information on growing vegetables for the home. The country has been called upon to produce the largest amount of foods in history and in order to do this each farm must grow its share of vegetables. As pointed out by the author, this is very much to the benefit of the farmer since a home garden is both profitable and healthful. The garden should be located near the house in a protected position, and steps should be taken to make the soil as rich as possible. Manure and green manure should be turned under and liberal fertilization given. Mr. Monosmith states that 20 tons of barnyard manure per acre are not too much and this should be supplemented with 600 to 800 pounds of a complete fertilizer such as 6-8-8 or 4-8-8 plus additional phosphate and nitrogen as needed. Extra nitrogen top-dressers are frequently desirable in connection with growing of the leafy vegetables. Rather complete cultural directions for all the important vegetables, planting dates, and suggested arrangements of the garden to provide fresh vegetables for the entire year are given:

"Hairy Vetch," Agr. Ext. Serv., Little Rock, Ark., Cir. 201, Aug. 1941, Charles F. Simmons.

"Fifty-fourth Annual Report, 1940-41," Agr. Exp. Sta., Fort Collins, Colo.

"Propagation of Plants," Agr. Exp. Sta., Fort Collins., Colo., Bul. 468, Nov. 1941, L. R. Bryant and George Beach.

"Pasture Investigations, Ninth Report, Ladino Clover Experiments, 1930 to 1940," Agr. Exp. Sta., Storrs, Conn., Bul. 235, July 1941, B. A. Brown and R. I. Munsell.

"Crisp-head Lettuce in Florida," Agr. Exp. Sta., Gainesville, Fla., Bul. 365, Dec. 1941, J. R. Beckenbach, F. S. Jamison, R. W. Ruprecht, and F. S. Andrews.

"Cultural Methods for Growing Peanuts," Agr. Exp. Sta., Experiment, Ga., Cir. 131, Nov. 1941, U. R. Gore.

"Sweet Clover for Kentucky," Agr. Ext. Serv., Lexington, Ky., Cir. 366, June 1941, E. N. Fergus, Ralph Kenney, and W. C. Johnstone.

"Trace Metals and Total Nutrients in Human and Cattle Foods," Agr. Exp. Sta., Amherst, Mass., Bul. 379, July 1941, E. B. Holland and W. S. Ritchie.

"The First Twenty Years Results in a Michigan Apple Orchard," Agr. Exp. Sta., East Lansing, Mich., Sp. Bul. 313, Dec. 1941, Walter Toenjes.

"Protein Surveys of American Hard Spring and Soft Winter Wheats," Agr. Exp. Sta., University Farm, St. Paul, Minn., Tech. Bul. 147, June 1941, C. H. Bailey.

"The Year-round Home Garden," Agr. Ext. Serv., State College, Miss., Ext. Bul. 121, Apr. 1941, R. O. Monosmith.

"Management of Sweet Clover in a Pasture System," Agr. Exp. Sta., Columbia, Mo., Cir. 215, Nov. 1941, C. A. Helm.

"Mineral Composition of Freshly Fallen White Pine and Red Maple Leaves," Agr. Exp. Sta., Durham, N. H., Tech. Bul. 77, June 1941, W. H. Lyford, Jr.

"Studies on the Bitter-pit Disease of Apples," Agr. Exp. Sta., Durham, N. H., Tech. Bul. 78, June 1941, O. R. Butler and Stuart Dunn.

"New Lawns," Cornell Univ. Agr. Ext. Serv., Ithaca, N. Y., Bul 429, Mar. 1940, Donald J. Bushey.

"Lawn Maintenance," Cornell Univ. Agr. Ext. Serv., Ithaca, N. Y., Bul. 430, Mar. 1940, Donald J. Bushey.

"The Wheat Contest—1941," Agr. Ext. Serv., Clemson, S. C., Cir. 199, Oct. 1941.

"Tennessee Shipper Strawberry," Agr. Exp. Sta., Knoxville, Tenn., Cir. 76, Dec. 1941, Louis A. Fister.

"Blossom Position in Pear Clusters and Set of Fruit," Agr. Exp. Sta., Burlington, Vt., Bul. 471, June 1941, E. W. Jenkins.

"Report of the Commissioner of Agriculture and the State Board of Agriculture and Immigration, 1939-1940," Dept. of Agr. and Imm., Richmond, Va.

"What's New in Farm Science," Agr. Exp. Sta., Madison, Wis., Bul. 453, Dec. 1941, Part I. An. Rpt. of Dir.

"Report of the Secretary of Agriculture, 1941," U. S. D. A., Washington, D. C.

"Report of the Chief of the Office of Experiment Stations, 1941," U. S. D. A., Washington, D. C.

"List of Bulletins of the Agriculture Experiment Stations for the Calendar Years 1939 and 1940," U. S. D. A., Washington, D. C., Misc. Pub. 459, Dec. 1941, Catherine E. Pennington.

Economics

¶ Bulletin 335 of the Nebraska Experiment Station "Income Levels of Contract Beet Workers in Nebraska," by F. Miller reports the results of a scientific approach to the problem of annual income levels of sugar beet contract workers in Nebraska. Since the involvement of this country in the war and the loss of supply of sugar from the Pacific area, our interest is all the more centered in the domestic beet sugar industry.

The growing of sugar beets requires approximately 93 hours of man labor per acre. Hand operations, including the loading of the beets when they are hauled from the fields, usually require about 53 man hours. Thus the opportunities for employment in the sugar beet field have attracted many people to the beet-growing areas of Nebraska and other important beet-producing states. It has been observed that the people who have grouped themselves around the industry vary a great deal in their capacity to accomplish useful work. The growing of sugar beets is a specialized type of agricultural production requiring skill and fitness of workers if the job is to be carried on efficiently.

The wages paid in the beet field are on a piece-work basis, and since 1934 minimum wages have been established for different areas of the country by the Secretary of Agriculture. For example, in the beet-producing areas of Scotts Bluff and Morrill counties, the minimum labor contract calls for $8 per acre for bunching and thinning, $2.50 per acre for hoeing, $1.50 per acre for weeding and 80¢ per ton for pulling and topping. Provisions of the Jones-Costigan Act setting up this procedure also provide that children under 14 years of age cannot be employed in the beet fields, and children 14 to 15 years of age may be employed only 8 hours per day.

The author calculated the average income levels of the beet workers' families through the survey method. Records were obtained from 135 families concerning the number and age of workers, acres of beets cultivated and harvested, the income from beet work and from all other sources, and the value of prerequisites furnished by the growers. The study disclosed that there was a rather wide variation in the average annual income of the various families ranging from $693.06 to $2,986.71. About 9.6% of the families interviewed received incomes between $693 and $800, and 20.7% received incomes in excess of $1,500. The average income of the 135 families from whom information was obtained was $1,296.08.

Approximately 78% of the families interviewed obtained living quarters from the growers during the beet-producing season. The size of houses furnished varied from one room up, with 56.2% having three or more rooms and about 26% having four or five rooms. Thirty-eight of the families interviewed owned homes clear of debt. Only three of the families interviewed did not own either an automobile or a truck. Purchase price of the automobiles varied from $25 to $1,468 and averaged $518.58. One-third of the

fathers and 30.5% of the mothers in the families contracting beet work had never attended an organized school. It was found that children over 16 years of age who were reared by families contracting beet work had received more educational training than their parents. Only 2.9% of the children over 16 years of age had not completed at least one grade of school, and more than one-fourth of them had received some high school training.

"Types of Farming in California Analyzed by Enterprises," Agr. Exp. Sta., Berkeley, Calif., Bul. 654, Sept. 1941, L. A. Crawford and Edgar B. Hurd.

"What the Farmers Told Us in Cumberland County," Dept. of Agr., Halifax, N. S., Bul. 5, Oct. 1941.

"Illinois Farm Outlook for 1942," Agr. Ext. Serv., Urbana, Ill., Cir. 520, Jan. 1942.

"Earn AAA Tree Payments," Agr. Ext. Serv., University Farm, St. Paul, Minn., Pamph. 86, Dec. 1941.

"Income Levels of Contract Beet Workers in Nebraska," Agr. Exp. Sta., Lincoln, Nebr., Bul. 335, Nov. 1941, Frank Miller.

"Progress in Achieving Soil and Water Conservation and Its Economic Aspects on Dairy Farms in the Flemington Area, New Jersey," Agr. Exp. Sta., New Brunswick, N. J., A. E. 54, Oct. 1941, Charles Messer, John W. Carncross, and Allen G. Waller.

"For Better Farming in Western North Carolina," Agr. Ext. Serv., Raleigh, N. C., Cir. 252, Oct. 1941, R. W. Shoffner.

"Quality-price Relationships of Cotton at Local Markets in Oklahoma," Agr. Exp. Sta., Stillwater, Okla., Bul. 250, Oct. 1941, Trimble Raymond Hedges.

"Forage Seed Crops—1940, Production and Income Statistics for Oregon by Counties," Agr. Ext. Serv., Corvallis, Oreg., Cir. 375, Aug. 1941, M. D. Thomas, L. R. Breithaupt, and N. I. Nielsen.

"Farmers' Marketing and Purchasing Associations in Tennessee," Agr. Exp. Sta., Knoxville, Tenn., Bul. 177, Sept. 1941, B. D. Raskopf and P. W. Voltz.

"AAA Faces the Future," U. S. D. A., Washington, D. C., G-112, July 1941.

"Annual Report of the Manager of the Federal Crop Insurance Corporation, 1941," U. S. D. A., Washington, D. C.

"Agricultural Statistics, 1941," U. S. D. A., Washington, D. C.

"Annual Report on Tobacco Statistics, 1941," U. S. D. A., Washington, D. C., Nov. 1941.

Old Crops Coming Home

Modern civilization is indebted to the Americas for many products now essential, of which the Old World knew nothing before Columbus discovered the New World, says an article in "Agriculture in the Americas," monthly Department of Agriculture publication.

As outstanding American natives, the author, E. R. Burkland, includes corn, grown from Canada to Patagonia; sweet and white potatoes; cocoa, used by the Aztecs as a food and as a medium of exchange; the peanut, found in ancient graves in Peru; rubber, particularly from the cultivated Hevea tree; the tomato; the pecan; the drugs, quinine and cocaine; vanilla; and numerous products less widely known, such as quebracho extract for tanning; the fibers, kapok, henequen, and sisal; manioc root, the source of tapioca starch; and important rotenone-bearing plants used in insect poisons.

"Today, many of these American natives are grown more widely outside than in the Americas," says Burkland. "The potato is of outstanding importance in northern Europe, and maize is a staple food in Italy, Spain, and southeastern Europe. The sweet potato was distributed across the Pacific and is well-nigh universal in tropical and sub-tropical countries. British India, China, and Africa are the chief peanut-producing areas.

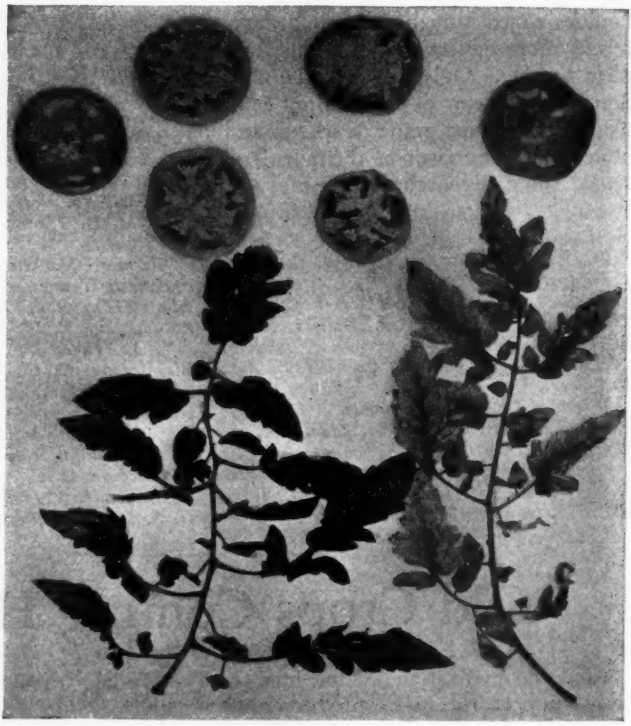
"Many of these crops of American origin are now produced in the Western Hemisphere either not at all or in such small quantities that consuming countries depend on sources outside the Western Hemisphere, where American natives thrive in foster homes. An important phase of the hemispheric agricultural program is to reestablish on their native soil products the Americas gave to the world."

Fertilizing for More and Better Vegetables

(*From page* 14)

Nitrogen hunger is most prevalent on sandy soils and on older plants. It can be corrected in a few days time with surface applications of 100 to 200 pounds of sulphate of ammonia if water is applied so that the nitrogen reaches the roots.

Phosphorus hunger causes the plant to become stunted and the foliage to become dark green to purplish in color. The dark green color of phosphorus-starved plants is often deceptive since growers generally consider a dark green color to be essential for health. A light green colored tomato plant, for instance, often is capable of yielding twice as much as its dark green colored neighbor. As already indicated, phosphorus hunger must be anticipated and corrective measures taken prior to planting.



Healthy tomato leaf and fruit (left); potash-starved leaf and fruit (right). Note the hollow, irregularly ripened fruit from the potash-starved plant. The leaves are yellowed, with greenish-tinted veins.

Potash hunger is often confused with conditions brought about by fungous diseases since it results in the speckling of the foliage and the death of the margins of the leaves. It also produces poorly colored and lopsided tomato fruits and cucumbers with constricted stem ends. Fertilizer applications for potash hunger also must be made prior to planting the crop.

With these generalizations in mind, we are now ready for some specific recommendations for fertilizer analyses. First we should correct the pH to 6-7 by the addition of lime, except for potatoes when it should be 5.0 to 5.2 if scab is prevalent. Muck soils require more calcium carbonate to effect pH changes than silt loam and sandy soils.

For silt loam soils a formula high in phosphorus such as a 2-12-6 or 4-16-4 is essential. The exact ratio should be modified if quick soil tests, hunger signs, or other data indicate a greater need for any fertilizer nutrient.

For sandy soils a 4-10-6, 4-8-8, or 6-8-6 may be advisable. Note that larger amounts of nitrogen are used. In addition to this, such soils frequently require surface applications of soluble nitrogenous fertilizers during the growing

season. Larger amounts applied before the crop is planted are likely to be leached away. Sulphate of ammonia plowed under to a depth of 4 to 5 inches is not leached away nearly so rapidly as it is when applied as surface dressings.

For black soils and muck, an 0-8-24, 3-9-18, or 0-12-12 fertilizer is generally recommended. Here potash is generally the limiting element and applications should be made at a depth of 3 to 4 inches at or prior to the time the crop is planted.

The amount to apply varies with the method employed. The most effective results are obtained by applications placed in bands several inches away from both sides of the rows and slightly deeper than the seed, say three inches deep. For sweet corn and beans planted in rows 3 feet apart applications of 125 to 150 pounds per acre produce excellent results. Of course such applications do not add much to the fertility of the soil. Broadcast applications of 500 pounds or more are generally required to effect equally good increases in yield.

If the rows are 18 rather than 36 inches apart, the same rate applied as band applications would require 250 to 300 pounds per acre; and in rows 12 inches apart, as for onions, it would require 375 to 450 pounds per acre. Except for potatoes, where the fertilizer is applied well to the sides of the rows, it is not considered good practice to apply more than 1,000 pounds even if the rows are only 12 inches apart. If greater amounts are used for the production of bumper crops, some of the fertilizer is broadcast. Larger amounts are also applied as row applications when asparagus patches are started.

Surface applications of soluble nitrogenous fertilizers should be made during the growing season as needed. The need for these nitrogenous applications becomes greater as the amount of the phosphorus and potash applications is increased.

Tobacco Growers Aim At Domestic Market

(*From page* 22)

reserve, a 3-10-7 formula may supply all the potash required for quality. However, few Coastal Plain soils have high potash reserves. Tobacco fertilizers should be made up with one-third of the nitrogen from high-grade organics, one-third from nitrates, and one-third from standard inorganic sources. The phosphorus may be derived from any available phosphoric acid, provided the calcium and sulphur requirements are satisfied.

"Muriate of potash should be used in quantities sufficient to satisfy the chlorine needs, and sulphate of potash magnesia may be used to supply all or a portion of the magnesia requirements. The remainder of the potash may be derived from any chlorine-free source. Rates of applications required for optimum yield and quality will vary with soil type and previous cropping history. On light, thin, sandy soils 1,000 pounds of a 3-10-10 per acre are not too much, but on deep, dark, mellow, Norfolk sandy loam soils in a good state of fertility 800 to 900 pounds are sufficient."

Mr. Carr says that there are many things besides seasons, soils, varieties, and fertilizers that influence the grade of tobacco. Spacing, topping, cultivation, and methods of harvest and curing are the most important of these. Close spacing tends to make the leaves thin and luggy, but is seriously complicated by the increased moisture requirement of the greater number of plants per acre. In periods of drought closely spaced crops suffer severely which, in extreme cases, often results in serious losses of both yield and quality. It is

doubtful that spacing closer than 22 inches in rows 3 feet 8 inches apart will pay.

The general practice of cultivating tobacco every week apparently tends to prolong the growth period and keep the crop green. In favorable seasons three cultivations after hoeing are about all that are needed. The crop should be laid by when about waist high. Later, if weed growth is bothersome, a wide scrape may be run through the middles. Laying a crop by early permits the roots to grow in the row middle which gives the plant a large root area and helps it to mature quickly. A quick-maturing plant produces the domestic grades now wanted.

The height at which a plant is topped also influences the grade of tobacco it produces. Leaving the top in a plant more or less starves the leaves which makes them thin and light and of the quality now wanted. However, leaving the tops in decreases yields about 25 per cent and also makes the crop highly susceptible to drought damage. In other words, a crop not topped is the same as a closely spaced crop—it requires large quantities of water. The risk of leaving the tops in is, therefore, not worth taking nor is it profitable. High topping will help to keep the leaves thin and will reduce the drought hazard considerably.

"Well-ripened tobacco is absolutely essential in producing domestic grades," declares Mr. Carr. "No doubt the fact that the 1941 crop ripened faster than it could be harvested had much to do with its surprisingly good quality. It was not highly colored, but ripe, thin, and luggy, or in other words, of good smoking quality.

"Let me urge each tobacco farmer to make every effort to produce a ripe, luggy, thin type of tobacco for 1942. The highly colored, solid, clear leaf grades no longer enjoy the demand they did several years ago."

Prune Trees Need Plenty of Potash

(*From page* 18)

each year for five years. In 1939 a second series of four trees in another badly affected part of the orchard was treated with sulphate of potash. This treatment has been repeated each year up to the present time. The effects of the potash were readily observable, even after the first treatment. Foliage was greener in color, scorch was lessened, and fruit size improved.

Yield records on the first series of trees in terms of green fruit per acre were obtained on the four potash-treated trees and four adjacent trees without potash in 1939 and 1940.

A record yield of green fruit was also obtained in 1940 on the second series of trees started in 1939. This showed: with potash, 4,575 pounds per acre; without potash, 1,762.5 pounds per acre.

Otto Orchard, French Prune Yields per Acre (green)

Year	With potash	Without potash
1939	5,831.2 pounds	881.2 pounds
1940	7,827.1 pounds	Crop worthless

Leaf analyses in 1940 showed that the potash-treated trees had a leaf potash content of 0.99% potassium. The trees without potash showed the very low leaf potash of 0.34% potassium. In 1941 the leaves on the potash-treated trees had 0.77% potassium, and the trees without potash showed a leaf analysis of 0.21% potassium. Thus it is again demonstrated that a build-up in the potash content of the leaf is accom-

panied by increased yields and other desirable effects on the tree.

In the case of the Otto orchard, it should be borne in mind that the potash level in the leaves is extremely low, and potash deficiency is acute. Even with repeated treatments of potash, the level is still below 1%, and the trees have not recovered entirely by any means. We can only speculate on how much greater build-up of leaf potassium there would have been if only one heavy initial application of sulphate of potash, say 25 pounds per tree, had been made instead of the yearly application of 5 pounds per tree. There is some evidence accumulating that these single heavy applications to fruit trees are very effective in supplying potash to the tree over quite a period of years after the application. Undoubtedly the trees in this test never could be transformed into large, healthy trees. The great improvement which has taken place in both trees and crops because of the potash treatments, however, shows the possibility of bringing this type of orchard into the range of profitable operation.

Several years ago a new block of French prune trees was planted in the Otto orchard on Rincon clay loam. Two rows of these young trees were chosen for fertilizer treatments in 1939, and the materials were applied. The treatments have been repeated each year since. It is of interest that the potash content of the leaves of these young trees, which have not yet reached bearing age, is beginning to show variation on the different fertilizer plots. The average leaf content of potassium for the two plots for each treatment in both 1940 and 1941 is given below.

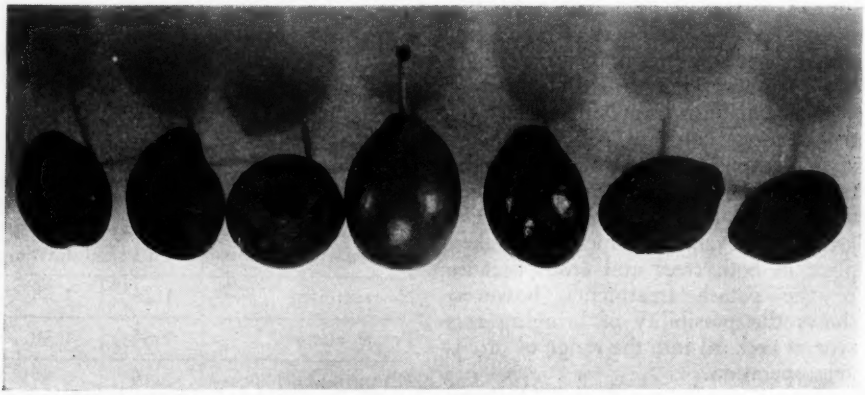
These results of leaf analyses on young trees indicate that potash seems to get into the tree more effectively

Treatment	Leaf content of potassium (%) Average two plots	
	1940	1941
Nitrogen-phosphorus	1.04	1.02
No treatment	1.58	1.38
Potash alone	1.84	1.50
Nitrogen-phosphorus-potash	2.19	2.08

Symptoms of potash deficiency on sugar prune trees in the Santa Clara Valley district (left). Sugar prunes as they should be (right); leaves in this orchard show high test for potash.

when used with nitrogen and phosphorus; also, that when nitrogen and phosphorus are applied without potash, the potash content of the leaves is lower than in the case of no fertilizer at all. Symptoms of potash deficiency are not apparent on these trees as yet, but in future years, when their fruit crops draw heavily on the potash supply, differences in the condition of the trees will undoubtedly become marked.

As a guide to the potash needs of prune orchards, the analysis of leaves holds much promise. Of course there are always exceptions to any interpretations which may be placed on leaf analysis, but if the leaf content of potassium drops below 1%, deficiency symptoms are usually apparent. If the leaf content drops below 0.5%, severe deficiency symptoms usually occur.



French prunes from trees suffering from potash deficiency. The prune in center is normal and from a tree which received potash.

It is quite probable that it will pay to apply potash at higher leaf potash levels than strictly deficiency levels; and it may be highly desirable from the standpoint of getting the best yields and quality of fruit to build up potassium levels in the leaves of prune trees to 2.5%.

Inevitably orchards suffer from neglect during the difficult periods of low prices for fruit. The prune grower has been going through just such a period of extremely low prices for his product, and has had to cut down on operating expenses a little more each year. Even though a good fertilizer program means lowered costs in the long run through better yields, better quality, and healthier trees, the use of adequate fertilizer has been omitted in many prune orchards under stress of difficult economic conditions. Now, however, when prune prices are higher and the grower again seems assured of reasonable returns on his crop, the improvement of trees and crops by using plenty of fertilizer should receive serious thought.

Potash is one of the fertilizers which lends itself to the "humps and hollows" of fruit growing. Generous applications of potash during the "hump" periods of higher fruit prices will mean that the trees will have a reserve to draw upon. One application of potash, if large enough, exerts its effect on the trees for several years. This means that trees which are adequately supplied with potash will still have reserves to draw upon during periods when fruit prices are low and fertilizer use in the orchard is drastically cut. It also means that this reserve of potash will keep the trees in better condition and will bring in greater returns in yield and quality in the "hollow" times when every advantage counts.

Cooperation

(*From page* 11)

grown in this field; those grown in 1940 were fertilized with 1,500 pounds of 3-9-18.

Even though the Jachims were not quite "tops" in corn, their yield, along with their potato and onion yields, was high enough to enable them to qualify as Champion Muck Farmers. This award is given by the Baltimore and Ohio Railroad Company to the grower who has the best yield record on potatoes, onions, and one other commercial muck crop.

Ed Jachim won the title of Potato King by growing 639.79 bushels per acre. He plowed his 170-acre potato field 10 inches deep on April 10 to 15. The ground was then double disked twice, harrowed twice, and rolled once. Twenty-five bushels per acre of certified Chippewa potatoes were planted in 32-inch rows, 4 inches deep, and 11 inches apart on May 15 to 20. The potatoes were harrowed three times, weeded twice, hand weeded twice, and a tractor cultivator was used on them twice. They were sprayed 10 times with a Bordeaux mixture. The first few spray mixtures contained calcium arsenate also. The field was fertilized with 800 pounds of 0-8-24 put on with a wheat drill and 800 pounds of 3-9-18 put on with a potato planter. The potatoes were dug the last week in September.

Because they do not like to be tied down the year around, the Jachims keep only one cow and no pigs. Chores are no bugaboo for them. When their corn crop is in and next year's wood supply laid by, they will overhaul all their farm machinery and put it in shape for the next year. There is some talk of a short vacation trip, busy farmers like these having no time for vacations in the summer. But for the most part they will hunt and trap right on their own farm for diversion, and perhaps lay plans for trying to win high yield championships in corn and onions next year, as well as potato king honors. Here's luck to one loyal, united family, who live on the farm and like it, and wouldn't change it for any other life.

W. M. Ross Conserves His Soil Fertility

(*From page* 20)

each milking. The milk house has a concrete floor, electric screen panels for fly eradication, an abundance of both hot and cold running water, and all necessary equipment which is electrically operated. He has modern bottle washers, milk aerator, ice machine, and cold storage box. The milk is not only handled with the utmost care and cooled immediately after milking but when bottled is placed in ice in large cans for delivery directly to the customer almost ice cold.

Mr. Ross produces most of his own dairy cows, raising from 30 to 40 heifer calves each year, or enough to replace one-third of his milking herd annually. His herd is culled regularly, all old and otherwise unprofitable animals being removed as soon as their usefulness has ended.

It is not too much to say that if all Mississippi's farm land was conserved and used as effectively as is the land on the Ross farm, it would mean a saving of millions of dollars worth of fertility annually and would enormously increase production of crops, pasture grasses and clovers, livestock, and livestock products.

Boron Deficiency on Long Island

(*From page 9*)

deficiency in relation to seasonal precipitation between Long Island and the vegetable regions of western New York. On Long Island it is the wet seasons when boron deficiency tends to be worst, while "upstate" it is essentially the dry seasons when the deficiency does most harm.

Control Measures

When considering measures for the control of boron deficiency, there are four major factors to consider:

1. The crop to be grown and its boron requirement.
2. The rotation into which the crop in question is to be fitted.
3. The soil reaction at which the crop is to be grown.
4. The fertilizer program that is to be followed.

As has been indicated already, the boron requirement of crops is extremely variable. What may be an inadequate quantity of boron for one crop may prove toxic to another. Table 1 gives the yields of Green Mountain potatoes grown on the same soil with varying applications of borax over a three-year period. The soil showed 98 per cent boron deficiency on cauliflower in 1937. It is quite clear from these data that although 5 pounds of borax greatly stimulated the growth and yield of the crop in 1938, the continuance of the application for 1939 and 1940 caused a distinct toxic build-up so that the gain of 163 bushels per acre from 5 pounds of borax over zero in 1938 was reduced to a loss of 2 bushels in 1940. This can be seen very clearly by referring to the lower part of Table 1, which is arranged to show the yield differences between the treatments over the three-year period studied. It should also be mentioned that on Long Island 1938 and 1940 were favorable potato years while 1939 was a very dry and unfavorable season.

TABLE 1.—YIELDS OF POTATOES PRODUCED ON A BORON-DEFICIENT SOIL WITH VARIOUS APPLICATIONS OF BORAX

Treatment Borax lbs. per acre	Yields by year			Bushels per acre Average
	1938	1939	1940	
0	341	139	390	293
1	418	163	408	339
5	504	159	388	351
10	404	148	391	314
20	336	122	363	274
Average	401	146	389	

Treatment Comparisons Borax lbs. per acre	Yield differences over three-year period			Interaction variance
0– 1	−77	−24	−18	176
0– 5	−163	−20	2	1,338**
0–10	−63	−9	−1	190
0–20	5	17	27	20
1– 5	−86	4	20	544**
1–10	14	15	17	0.4
1–20	82	41	45	85
5–10	100	11	−3	520**
5–20	168	37	25	1,049**
10–20	68	26	28	138

** Highly significant.

Thus it is obvious that potatoes, although requiring boron and responding to it when grown on boron-deficient soils, can be very easily satisfied with small quantities of the element and will show up toxic effects very rapidly after the optimum amount of boron is supplied.

In contrast to potatoes, Table 2 gives the yields and percentages of boron deficiency symptoms of rutabagas obtained from varying applications of borax when grown on a boron-deficient soil. With this crop it is quite evident that up to 20 pounds of borax per acre were required for adequate growth,

TABLE 2.—YIELDS AND PERCENTAGE OF "BROWN HEART" OF RUTABAGAS GROWN ON A BORON-DEFICIENT SOIL WITH VARYING AMOUNTS OF BORAX

Treatment Borax lbs. per acre	Yield Tons per acre	"Brown heart" Percentage	
0	7.1	72	3-year average
1	7.7	38	
5	6.9	9	
10	7.2	6	
20	7.0	4	
50	9.9	0	1 year
100	7.9	0	
200	0.4	0	
400	0.1	0	
Least difference required	2.9	2	

TABLE 3.—YIELDS AND PERCENTAGE OF "BLACK CANKER" IN TABLE BEETS GROWN ON A BORON-DEFICIENT SOIL WITH VARYING QUANTITIES OF BORAX

Treatment Borax lbs. per acre	Yield Tons per acre	"Black canker" Percentage
0	9.3	33
1	9.1	23
5	9.1	13
10	8.4	11
20	8.2	9
Least difference required	Not significant	2

while as much as 50 pounds per acre did not decrease growth materially. Results with beets, given in Table 3, are quite similar. The yield data of other crops (Table 4) show the nature of the tolerance limits between deficiency and toxicity.

With these figures in mind, it is obvious that when a crop which requires a large quantity of borax, such as beets, is to be grown on a boron-deficient soil, the other crops which follow it must be considered also. If the chance of "carry-over" effect is considerable, then a compromise must be effected between controlling deficiency on the large boron feeder and avoiding a toxic residual effect on the succeeding crop. Naturally, the danger of toxic "carry-over" is inversely proportional to the leaching rate of the soil employed. As a rule, Long Island soils leach sufficiently to prevent any significant toxic accumulation for most crops; yet the case of potatoes, previously mentioned, is an instance where it can occur.

This particular instance is of considerable importance on Long Island since a standard practice is to rotate cauliflower with potatoes in a 1:3 year rotation respectively. Table 5 shows the relation of boron deficiency and resulting marketable yield which is

TABLE 4.—YIELDS OF VARIOUS VEGETABLE CROPS GROWN ON A BORON-DEFICIENT SOIL WITH VARYING QUANTITIES OF BORAX

Borax lbs. per acre	Snap beans Bushels per acre	Carrots Tons per acre	Brussels sprouts Quarts per acre	Peas Bushels per acre	Lima beans Bushels per acre	Spinach Bushels per acre
0	759	9.57	2,083	281	208	906
1	824	9.86	1,770	302	202	937
5	653	9.56	1,922	326	211	974
10	518	9.04	2,005	261	180	777
20	474	7.27	1,908	245	153	716
Least difference required	162	1.70	Not significant	41	Not significant	169

TABLE 5.—YIELD OF MARKETABLE CAULIFLOWER AND PERCENTAGE INCIDENCE OF "HOLLOW HEART" ON A BORON-DEFICIENT SOIL WITH VARYING APPLICATIONS OF BORAX

Treatment Borax lbs. per acre	Yield Crates per acre	"Hollow heart" Percentage
0	100	65.0
1	351	32.1
5	446	17.1
10	553	3.3
20	582	0.7
Least difference required	60	2.4

affected by various borax applications on cauliflower when the crop is grown on a boron-deficient soil. This clearly indicates that an application of 10 to 15 pounds of borax per acre would be good practice. However, we are naturally skeptical in recommending more borax than 10 pounds per acre for any one crop of cauliflower when it is known that potatoes are to follow. In recent years there have been many instances where 10 pounds of borax per acre were applied, and still the cauliflower developed some "hollow stem" and "brown rot." Under such circumstances it is obvious that 15 pounds of borax per acre should be applied, and it is doubtful that the possible reduction in yield of the succeeding potato crop would be sufficient to offset the material gain by the substantial control of "brown rot" on the cauliflower.

Soil reaction plays a highly significant role in plant growth through its effect upon the availability of plant nutrients. Boron cannot, at present, be considered an exception. Soils which are alkaline in reaction invariably tend to render boron unavailable. This does not infer that alkaline soils are invariably boron deficient, but merely that on alkaline soils any boron naturally present or artificially added will be less available for plant growth than it would be on an acid soil. The exact reason for this has received several explanations, which should be thoroughly substantiated before being accepted. To the grower, however, it is a fact. Any treatment

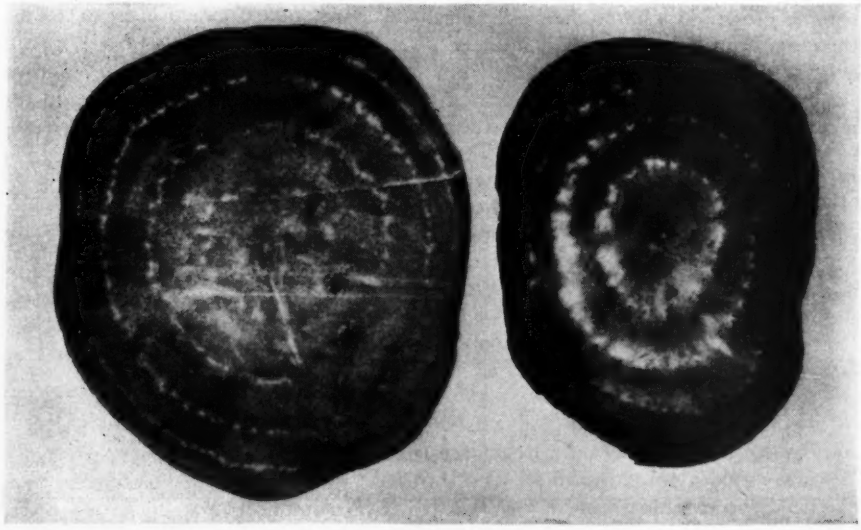


Fig. 5. Lack of sufficient boron will cause breakdown in certain root crops. Table beets grown with borax (left) and without borax (right).

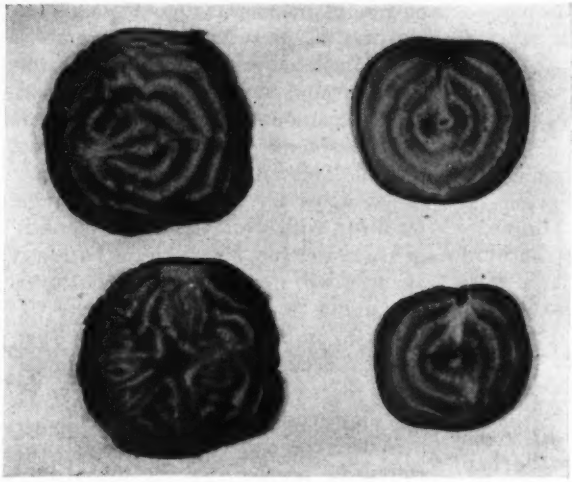


Fig. 6. Mangel beets showing external, pink variety, and internal, yellow variety, breakdown.

which tends to increase acidity on a boron-deficient soil tends to increase available boron. However, it also tends to expose boron to greater leaching on well-drained soils. Conversely, any treatment which tends to increase alkalinity tends to reduce boron toxicity, increase deficiency, and conserve the boron against leaching. On this basis the vegetable grower has to operate with a compromise. He should grow his crops at the optimal soil reaction for his particular rotation and apply borax when it becomes deficient in accordance with the requirement of the particular crop and in amounts to overcome the immobilizing effect of the particular soil reaction.

On Long Island certain cases of boron deficiency have been found to have been induced by applications of lime, but in general the deficiency appears to arise from leaching at acid reactions along with removal by harvested crops. Thus with cauliflower growing over a wide range of soil reactions, it was found that boron deficiency injury occurred to a greater extent at acid reactions when no borax was applied, but the application of borax was far more effective as a controlling agent at the more acid ranges than it was at the relatively alkaline reactions, indicating that an acid reaction permits more leaching than an alkaline reaction but that control in the acid region is easier. An illustration of this is given in Table 6.

Recent experiments have led to the conclusion that potash fertilization is related to the incidence of boron deficiency. It is found that where application of potash has greatly exceeded that required by any crop, particularly one which has a high boron requirement, the development of boron deficiency is accentuated. Carefully controlled experiments suggest, however, that this may arise from the application of an unbalanced fertilizer. Dr. J. W. Shive of New Jersey has obtained some very impressive results in support of this point. Therefore, it is premature to attempt explanation as to why potash should increase boron deficiency under certain conditions.

TABLE 6.—INCIDENCE OF BORON DEFICIENCY SYMPTOMS ON CAULIFLOWER AND RELATIVE CONTROL BY BORAX AT VARIOUS DEGREES OF SOIL ACIDITY ON LONG ISLAND SOIL

Soil reaction pH range	Degree of injury*		Difference (Relative control)
	Borax applied	No borax	
4.7 to 5.0	0.44	2.80	2.36
5.0 to 5.5	0.40	1.90	1.50
5.5 to 6.0	0.40	1.40	1.00
6.0 to 7.1	0.20	0.90	0.70

* Degree of injury determined by a grade index, 0 =no injury.

Data adopted from Hartman, J. D. Amer. Soc. Hort. Sci., Vol. 35: 523: 1938.

Methods of Application

Borax may be applied in various ways, of these the most practicable is inclusion of it in the general fertilizer. This is particularly the case when the fertilizer is applied broadcast. Application of borax in fertilizer applied in bands on either side of the plant row enhances the possibility of temporary toxicity which may prove harmful. Under such circumstances it is wiser to apply smaller amounts than when it is distributed broadcast.

A second method employed on Long Island, under certain conditions, is to include the borax in post-planting side-dressings. Here again it is recommended that the application be kept down to below five pounds of borax per acre.

The third method, which is more of an emergency procedure, is to apply the borax in a spray either alone at the rate of 1 pound per 100 gallons of water, or 2 — 3 pounds per 100 gallons of spray in a typical bordeaux mixture (the borax is added after the spray mixture is prepared). It is seldom that more than 2 — 3 pounds of borax per acre can be applied by this method, but under certain conditions when early symptoms of boron deficiency appear it is an effective measure for protection against further loss.

Many fertilizer companies include borax in certain of their standard fertilizer mixes. This is a great advantage as it eliminates the tiresome necessity of careful home mixing. However, it also has one drawback, the amount of borax included may not be enough for the crop and soil under consideration with the amount of fertilizer to be applied, or conversely it might be too much. This latter would be unusual, however, as few companies prepare a fertilizer with more than five pounds of borax per ton. Some local fertilizer agencies will mix up a specific fertilizer containing a prescribed quantity of borax to fit any situation the grower might encounter. This arrangement is, of course, admirable and well worth the slight cost involved.

Where the correct amounts of borax cannot be purchased ready mixed in a fertilizer, it is necessary to "home mix" the borax into the fertilizer at the rate prescribed. This must be done with extreme care as complete mixing is essential to avoid toxic and deficiency spots developing in the field later.

The final suggestion to vegetable growers who might encounter a boron deficiency is that local county agents and agricultural research workers probably have a far better understanding of the nature of the deficiency and how to control it under the conditions where they work than even the most specialized experts elsewhere, and therefore the grower had better rely mainly on their recommendations rather than solely upon "what he reads in the papers."

Squads Right!

(*From page* 5)

and yon and returning thence, is going to take some starch out of extension men too. Some states already have issued gubernatorial manifestos anent too much sashaying into the sticks. The cure for this may be more correspondence schools of agriculture like we had when I pushed a plow; or else we'll have to mix the Holstein, Jersey, Berkshire, Shropshire, and Rhode Island Red breeders into one mass meeting and learn how to picnic together and discuss farming as a whole, rather than piecemeal in compartments. Then again we can bunch up some of our roving saviors of the soil in one carload and pounce on the unsuspecting growers in a solid mass of united erudition.

They used to come that way anyhow in some sessions afield, and the farmers lasted through the ordeal safely. Now just let 'em come in one wagon and unload their maps together.

Such deprivation hits us older coots harder than it should, when you consider our antecedents afoot. But as for the younger generation, it's a different picture and one to be felt more keenly. Our kids grew up with a garage in the rear yard instead of a backhouse. Hitching blocks were unknown to them. Baby buggies were obsolete in their infanthood, and we gave them an auto airing instead of a change of diapers. We bought them broken-down jalopies instead of shaggy Shetland ponies. We taught them that the jerking thumb meant more than the willing foot. Theirs has been the era of gas and get-there.

BUT most of those lads are absent and all we've got to do is persuade the gals that complexions are gained by exercise and legs are something to use and not to look at. Barring a few bunches caused by a possible dearth of girdles and some snags induced by silk scarcity, our feminine scenery won't be utterly ruined by all this deprivation.

This has been a sedentary age and except for policemen, dime-store clerks, and mail carriers, precious few of us have legged it along very lively. Even farmers are so used to sitting down and pushing with their toes to accomplish everything from plowing to courting that the idea of hoofing it awhile sounds like an insult.

Since those delivery boys we knew are drilling now and extra calls for groceries are taboo, a lot of us must conserve on our traffic demands on merchants. Phoning to have a cake of yeast and a paper of pins toted out by a red-faced driver in a two-ton truck is a thing of the past. And the rival milk concerns that dip out of the same tank or buy along the same rural route while refusing to consolidate their city deliveries are bound to revamp their systems in a hurry, without much net loss in vitamins either.

And when it comes to keeping sweet in a crisis, we can do it without hoarding sugar. Several women in our locality stocked up so heavily that their attic floors are sagging, and one would think they intend to go into the confectionary trade. Yet a majority of them are so fleshy already that they are fretting about the girdle famine, so a little less sucrose and dextrose for them would prove a buxom boon. They should remember that hoarding sugar takes cheek but that going without a little spells "chic."

THEORIZING on the worst deprivations we have had up to ground hog day, I surmise we will improve our physique and stamina by doing more walking and less nibbling of sweets. I for one won't kick until they begin to ration our paper and typewriter oil, after which I'll quit trying to reform the public in general each month and volunteer in the civilian defense squad to perform patriotic nonessentials in a highly becoming way.

While we are on this subject, what are essentials and nonessentials? Some wisecracker working in a munitions plant was recently credited with a new fancy slogan—"He who relaxes helps the Axis!" I give him due praise for coining a catchy motto that every agitating union boss should note with some remorse over past performances. I take it that the author of this phrase meant "soldiering" as we know it in civilian terms. I hope he didn't mean relax in the sense of taking time out for rest and refreshment, or a pause in the pace that kills.

There is no greater threat to the morale and courage and persistency of a community in wartime than grinding tension and an overwrought, nervous force. Folks in the farm belt have come to me seriously asking if rural social clubs, musical programs, summer picnics, harvest festivals, and plow-

ing and husking contests should be permitted to interfere with the direction of defense activities.

In reply, why not inquire if any or all of these wholesome rural divertissements ever hindered the conduct of progressive crop and livestock production or soil improvement, or diminished the zest for standardizing and grading foods. Quite the opposite in most experience, because such periods of recreation, change of pace, social contacts, and cultural refreshment have reinvigorated and strengthened the aim, purpose, and practice of rural craftsmanship.

THIS war period keys soil tillers to a concerted high pitch of enthusiasm and often induces them, by a blend of patriotism and profits, to exert extra efforts in their profession. Short of help and without intervals of release and recess, these high-geared soldiers of the soil are apt to get out of step, fumble their accouterments, and miss the mark. Moreover, some of them are going to have a sorry reaction, a sad letdown and a bad hang-over from the effects of too much of this persistent pressure. We must train ourselves to be as clear-headed and resolute when victory comes as we are during the winning of it.

Every army post has its spells of relaxation and intervals of fun and frolic. Defenders of the Philippines shouted loudly for more cheerful radio broadcasts from home, short-waved across the vast expanse of "ocean sea" as happy ties binding them to the home circles for which they fought and died. So it is thumbs down on the crepe-hangers who want us to be dour and dolorous. You can't win on a sour mind any more than you can on an empty stomach.

Finally, we've got to think out a system to handle the kicks and complaints. Quite often I become superheated about some passing injustice or awkward impasse in public events and administrative maladjustments. We all do, or we wouldn't be native Americans with traditions of outspoken opinion. It's our job to attach some kind of safety valve on some of this before it gets into the wrong drift.

One way would be to hold regular grumble fests like we used to stage rummage bees. Have the neighbors save up their pet peeves and come up to bat ready to unload them and have them done with for keeps. Uncork our bitters and pass the bottle around. Give prizes for the best grouches and treat them like we do the tales of Munchausen—something to hear in amusement and nothing to take very seriously. If we could go a step further and have a Grumble Collector in every township and let him pass on the best ones to a state Grumble Department, thence direct them by express to Washington for the archives or for the appendix to the Congressional Record, by this means we would release the pent-up feelings and drain them all off to a common cesspool of reserved comments —keeping them there in cold storage until the war is over.

AND at the last count, we'll need a strong stock of imagination to do a "squads right" along with vibrant youth! All the old moss-grown ideas and habits which in ordinary times the elder citizens find it hard to cast aside are in for a unique overhauling. Our own generation has seen the privations and makeshifts of pioneer communities, and also realized the fruit of invention and progress. It shouldn't be so tough on us to recast our lives awhile in the terms of our own youth while we keep the home fires blazing brightly.

Whatever comes, let's remember we can't be "all out" and complain of being "all in" at the same time. While this fracas continues, we who undergo rationing while the boys take their rations are the reserves and the home guards. I am sure history teachers in 1965 won't be able to say it was the lack of "ground crews" that clipped the wings of victory.

A small boy, eight, eyed a small spider.

"Daddy, do spiders bite?"

"Very few of them we find around here do."

"Not at all?"

"Not at all."

"Well, do they pinch?"

"No, lad, they don't pinch."

"Don't they hurt you at all?"

"Nope, they don't hurt you at all."

"Well, anyhow they scare hell out of you!"

She: "Do you think I show distinction in my clothes?"

He: "Well, I wouldn't say distinction. I think distinctly would be a better word."

The morning after
The night before,
Our cat came home
At the hour of four;
The innocent look
In her eyes had went,
But the smile on her face,
Was a smile of content.

SHE DIDN'T CARE

"Madam, you'll have to pay for that boy."

"But I never have before."

"That don't matter to me. He's over 12 years old and you'll have to pay his fare or I'll put him off the car."

"Put him off. What do I care? I never saw him before."

Grandma says that in her girlhood days the girls never thought of doing the things they do today, and then she added wistfully, "That's why we didn't do them."

"Darling, I could sit here and do nothing but look at you forever."

"Yeah, that's what I'm beginning to think, too!"

Mistress: "Marie, you were entertaining a man in the kitchen last night, weren't you?"

Marie: "That's for him to say, ma'am. But I tried my best."

EXPENSIVE

At a certain college in the north of New England the male students were not permitted to visit the resident lady boarders. One day a student was caught in the act of doing so and was court martialed.

Said the Dean: "Sir, the penalty for the first offense is 50 cents, for the second, $2.50, for the third, $5, and so on up to $15."

In solemn tones the trespasser inquired: "How much would a season ticket cost?"

Sergeant: "Now, suppose you are on your post one dark night. Suddenly a person appears from behind and wraps two arms around you. What will you call then?"

Doughboy: "Let go, honey."

A census enumerator approached a lounging Negro dandy. He asked and learned the man's name, age, place of residence; then inquired, "What's your business?"

The answer came superciliously: "I owns a hand laundry, I does."

"Where is it located?"

"Dar she comes now!"

FERTILIZER *Films* AVAILABLE

WE shall be pleased to loan to agricultural colleges and experiment stations, county agricultural agents, vocational teachers, responsible farm organizations and members of the fertilizer trade, films bearing on the proper use of fertilizers, particularly potash. Anyone interested in showing these films should direct his requests to our Washington office.

Potash Production in America

Shows the location and formation of American deposits and scenes of mining and refining of potash in California and New Mexico.

16 mm.—silent, color—running time 40 min. (on 400 ft. reels).

Potash in Southern Agriculture

Covers fertilization and potash deficiency symptoms of cotton, tobacco, and corn at several Experiment Stations in the South, also crops in the field, fertilizer placement work, and scenes in a fertilizer factory.

16 mm.—sound, color—running time 20 min. (on 800 ft. reel).

Bringing Citrus Quality to Market

Shows influence of fertilizers, particularly potash, on yield and thickness of rind, volume of juice, weight, and general appearance of citrus fruit.

16 mm.—silent, color—running time 25 min. (on 800 ft. reel).

New Soils From Old

Experimental work on Illinois Soil Experiment Fields and the benefits from a balanced soil fertility program using limestone, phosphates, and potash in growing corn, wheat, clover, and other crops.

16 mm.—silent, color—800 ft. edition running time 25 min.; 1,200 ft. edition running time 45 min. (on 400 ft. reels).

In The Clover

Depicts the value, uses, and fertilizer requirements of Ladino clover in Northeastern agriculture.

16 mm.—silent, color—running time 45 min. (on 400 ft. reels).

Ladino Clover Pastures

Determining proper fertilization of Ladino Clover for best utilization as pasture for livestock and poultry in California.

16 mm.—silent, color—running time 25 min. (on 400 ft. reels).

Potash Deficiency in Grapes and Prunes

Effects of potash deficiency and fertilizer treatments on grapes and prunes in California.

16 mm.—silent, color—running time 20 min. (on 400 ft. reel).

Machine Placement of Fertilizer

Methods of applying fertilizer to California orchards, lettuce, and sugar beets with various types of apparatus devised by growers.

16 mm.—silent, color—running time 20 min. (on 400 ft. reel).

Potash From Soil to Plant

Sampling and testing soils by Neubauer method to determine fertilizer needs and effects of potash on Ladino clover in California.

16 mm.—silent, color—running time 20 min. (on 400 ft. reel).

Requests for these films *well in advance* should include information as to group before which they are to be shown, date of exhibition (alternative dates if possible), and period of time of loan.

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